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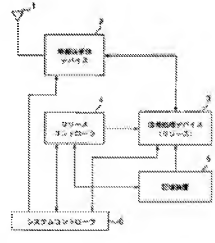
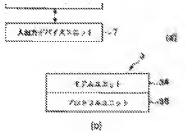
(54) RADIO COMMUNICATION DEVICE CAPABLE OF COPING WITH PLURAL RADIO COMMUNICATION SYSTEMS

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a radio communication system, with which the resource of a signal processing device can be controlled accurately and efficiently.
SOLUTION: The radio communication device, which can be applied to a plurality of radio communication systems, comprises a radio-transmission reception device 2 which is constituted so as to transmit and receive radio signals; the signal processing device 3 which contains a resource containing a defined function, in which the resource controls



at least one modem function and one protocol function, and which is constituted in such a way that the required signal processing operation is performed by the resource, when the signal is transmitted and received; and a controller 4 by which other modem functions and other protocol functions, corresponding respectively to the radio communication systems, are supplied to the signal processing device which are to be redefined for the resource.



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]Radio communication equipment applicable to two or more radio communications systems characterized by comprising the following.
A radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received.
A signal processing device constituted so that this resource might manage at least one modem function and a protocol function including a resource with which a function was defined and this resource might perform required signal processing with said transmission and reception.
A controller which supplies other modem functions and protocol functions respectively corresponding to said radio communications system to said signal processing device that it should redefine to said resource.

[Claim 2]The radio communication equipment comprising according to claim 1:
Processors in general as said a part of resource constituted so that said a part of signal processing might be performed, when said signal processing device executed a given program.
A register array which holds this data in order that data may be further delivered [it may contain with a signal processing unit as said a part of other resources constituted so that said a part of other signal processing might be performed, and / said processors in general] and received direct between signal processing units.

[Claim 3]. Said signal processing device was constituted so that circuitry could be redefined with an aggregate of two or more logical circuits which perform a fundamental operation of at least a part of said signal processing. At least one programmable hardware device as said a part of resource, Said at least a part of other signal processing including a general-purpose

processor as said a part of other resources to perform by executing a predetermined program said controller, The radio communication equipment according to claim 1 which controls said signal processing device that an assignment of processing which should be made to perform to said programmable hardware device and a general-purpose processor, respectively should be determined according to the contents of said signal processing, and said signal processing function should be defined as said resource according to this determination.

[Claim 4]. Said signal processing device was constituted so that circuitry could be redefined with an aggregate of two or more logical circuits which perform a fundamental operation of at least a part of said signal processing. At least one programmable hardware device of said resource made a part at least, The 1st memory that memorized a program which shows a procedure of said signal processing, and in order to make said signal processing perform to said signal processing device, The 2nd memory that memorized two or more circuitry description according to contents of processing of said programmable hardware device, so that said program may be read from said 1st memory based on control from said controller and circuitry description of said programmable hardware device may be changed according to this program that carried out reading appearance, The radio communication equipment according to claim 1 containing a program sequencer which controls said programmable hardware device and the 2nd memory.

[Claim 5]. Said signal processing device performs said at least a part of other signal processing by executing a given program. Including further a general-purpose processor as said a part of other resources said program sequencer, An assignment of processing which should be made to perform to said programmable hardware device and a general-purpose processor according to said program read from said 1st memory, respectively is determined, The radio communication equipment according to claim 4 which gives execution instruction of processing which should choose one of the circuitry description of said plurality memorized by said 2nd memory according to this determination, and should be given to said programmable hardware device, and should be made to share with this general-purpose processor to a general-purpose processor.

[Claim 6]Radio communication equipment applicable to two or more radio communications systems characterized by comprising the following.

A radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received.

A signal processing device constituted including a resource which can redefine a signal processing function so that this resource might perform signal processing of a required predetermined function with said transmission and reception.

A controller which controls said signal processing device according to resource quantity required to define a signal processing function newly required of said resource, and surplus

resource quantity that said signal processing function newly demanded should be defined as said resource.

[Claim 7]Said controller acquires composition descriptive information which is provided from the outside of said radio communication equipment and which shows composition of said signal processing function newly demanded, According to resource quantity required to define said signal processing function newly demanded as said resource using acquired this composition descriptive information, and surplus resource quantity of said resource, The radio communication equipment according to claim 6 which controls said signal processing device that said signal processing function newly demanded should be defined as said resource.
[Claim 8]. Said controller is provided from the outside of the (a) aforementioned radio communication equipment. Composition descriptive information which shows composition of said signal processing function newly demanded is acquired via said radio-transmission-and-reception device, (b) Calculate resource quantity required to define said signal processing function newly demanded as said resource using acquired this composition descriptive information, (c) Measure this ****** resource quantity and initial resource quantity which said signal processing device has beforehand, and when (d) this ****** resource quantity is smaller than initial resource quantity, Grasp said surplus resource quantity and by measuring (e) this grasped surplus resource quantity and resource quantity required to define said signal processing function newly demanded as said resource, The radio communication equipment according to claim 6 which performs this additional definition when it judges whether an additional definition of said signal processing function newly demanded is possible and it is judged to said resource that additional (f) this definition is possible.
[Claim 9]A radio communications system comprising:
The radio communication equipment according to claim 7.
An information providing device which provides said controller of this radio communication equipment with said composition descriptive information.

[Claim 10]The radio communications system according to claim 9 with which said information providing device is installed in a base station which performs said radio communication equipment and radio.
[Claim 11]The radio communications system comprising according to claim 9:
The 1st radio-transmission-and-reception device constituted so that said radio communication equipment might perform transmission and reception of said information providing device and a radio signal.
A signal processing device constituted including a resource which can redefine a signal processing function so that this resource might perform signal processing of a required

predetermined function with said transmission and reception.
According to resource quantity required to define a signal processing function newly required of said resource, and surplus resource quantity of said resource, The 2nd radio-transmission-and-reception device constituted so that the 1st controller that controls said signal processing device might be provided that said signal processing function newly demanded should be defined as said resource and said information providing device might perform transmission and reception of said radio communication equipment and a radio signal.
Based on said required resource quantity which acquired information including an operating condition of said resource, and has been grasped based on this information, and said surplus resource quantity, The 2nd controller that controls said 2nd radio-transmission-and-reception device that said 1st controller should be provided with information for defining said signal processing function newly demanded as said resource.

[Claim 12]A radio-transmission-and-reception device constituted in radio communication equipment applicable to two or more radio communications systems so that a radio signal might be transmitted and received, A signal processing device constituted so that this resource might perform signal processing of a required predetermined function with said transmission and reception including a resource which can redefine a signal processing function according to a predetermined software module, Memory storage constituted so that two or more software modules which corresponded to said two or more radio communications systems, respectively might be memorized, At least one software module corresponding to a predetermined radio communications system with which said radio communication equipment is applied is read from said memory storage, radio communication equipment possessing a controller which controls said signal processing device and memory storage in order to give this software module that carried out reading appearance to said resource.
[Claim 13]Said memory storage is constituted so that two or more software modules corresponding to classification of two or more communications may be memorized further, and said controller, At least one software module corresponding to classification of communication performed by said radio communication equipment is read from said memory storage, the radio communication equipment according to claim 12 which controls said signal processing device and memory storage in order to give this software module that carried out reading appearance to said resource.
[Claim 14]A resource manager constituted so that said controller might manage timing which performs a rewriting order of a software module in said resource, judgment whether this rewriting is performed, and this rewriting, Based on directions from said resource manager, a predetermined software module is read from said memory storage, the radio communication equipment according to claim 12 containing a rewriting processor which gives this module that

carried out reading appearance to said resource, and rewrites a software module in this resource.

[Claim 15]A resource manager constituted so that said controller might manage timing which performs a rewriting order of a software module in said resource, judgment whether this rewriting is performed, and this rewriting, A download buffer constituted so that at least one software module downloaded from the outside might be buffered, Based on directions from said resource manager, at least one software module is read from either [at least] said memory storage or a download buffer, the radio communication equipment according to claim 12 containing a rewriting processor which gives this module that carried out reading appearance to said resource, and rewrites a software module in this resource.

[Claim 16]A radio-transmission-and-reception device constituted in radio communication equipment applicable to two or more radio communications systems so that a radio signal might be transmitted and received, A signal processing device constituted so that this resource might perform signal processing of a required predetermined function with said transmission and reception including a resource which can redefine a signal processing function according to a predetermined software module, Two or more software modules which corresponded to two or more signal processing functions which can be carried out by said signal processing device, respectively, Memory storage constituted so that a table which recorded a using history of each of this software module at least might be memorized, At least one software module corresponding to a signal processing function which should be made to perform to said signal processing device is read from said memory storage, this software module that carried out reading appearance being given to said signal processing device, and with reference to said table further, Radio communication equipment possessing a controller which controls said signal processing device and memory storage in order to rewrite at least one software module memorized by said memory storage.

[Claim 17]Said memory storage is recording frequency in use of each of this software module on said table as a using history of each of said software module.

The radio communication equipment according to claim 16 which controls said memory storage so that said controller may perform said rewriting by deleting a software module in which said frequency in use is one [minimum] of each software modules memorized by memory storage with reference to said table.

[Claim 18]Said memory storage is recording the newest use time of each of this software module on said table as a using history of each of said software module.

The radio communication equipment according to claim 16 which controls said memory storage so that said controller may perform said rewriting by deleting one software module with said oldest newest use time among each software module memorized by memory storage with

reference to said table.

[Claim 19]Said memory storage is recording size of each of this software module on said table as a using history of each of said software module.
The radio communication equipment according to claim 16 which controls said memory storage so that said controller may perform said rewriting by deleting a software module in which said size is one [greatest] of each software modules memorized by memory storage with reference to said table.

[Claim 20]Said memory storage is recording a version of each of this software module on said table as a using history of each of said software module.
Said controller compares a version of a software module memorized by a version and said memory storage of at least one software module corresponding to a signal processing function which should be made to perform to said signal processing device with reference to said table, the radio communication equipment according to claim 16 which controls said memory storage in order to read this software module from said memory storage and to give this software module that carried out reading appearance to said signal processing device, if a version of these both sides is equal.

[Claim 21]Including further a download buffer constituted so that at least one software module downloaded from the outside might be buffered, if said controller does not have an equal version of said both sides, Download from the outside at least one software module corresponding to a signal processing function which should be made to perform to said signal processing device, and it buffers in said download buffer, The radio communication equipment according to claim 20 which controls said signal processing device in order to give a buffered this software module to said signal processing device.
[Claim 22]Radio communication equipment applicable to two or more radio communications systems characterized by comprising the following.
A radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received.
A signal processing device constituted so that this resource might perform signal processing of a required predetermined function with said transmission and reception including a resource which can redefine a signal processing function according to a predetermined software module.
Two or more software modules which corresponded to two or more signal processing functions which can be carried out by said signal processing device corresponding to two or more radio communications systems which can apply said radio communication equipment, respectively.

Memory storage constituted so that two or more 1st data files that have a file format corresponding to peculiar application software prepared to each of each of said radio communications system, respectively, and the 2nd data file with common file form might be memorized.
The 1st conversion method for performing this conversion in order to change into said 2nd data file 1st at least one data file memorized by said memory storage and to newly store it in said memory storage.
The 2nd conversion method for changing into said 1st at least one data file 2nd at least one data file memorized by said memory storage.
a controller which controls said signal processing device and memory storage in order to read a software module corresponding to one predetermined radio communications system with which said radio communication equipment is applied from said memory storage and to give this software module that carried out reading appearance to said signal processing device.

[Claim 23]The radio communication equipment according to claim 22 with which said controller performs said conversion including a processor when, as for said 1st and 2nd conversion methods, said processor performs software for conversion.
[Claim 24]Said 2nd conversion method is followed on said controller reading a software module corresponding to said one predetermined radio communications system from said memory storage, and giving said signal processing device, The radio communication equipment according to claim 22 changed into said 1st data file with a file format corresponding to application software peculiar to said one predetermined radio communications system for 2nd at least one data file memorized by said memory storage.
[Claim 25]The radio communication equipment according to claim 22 with which said application software is telephone directory management software, and said memory storage memorizes a telephone number file as said 1st and 2nd data files.
[Claim 26]The radio communication equipment according to claim 22 with which said application software is the browsing software for a Web page, and said memory storage memorizes a URL (Uniform Resource Locators) file as said 1st and 2nd data files.
[Claim 27]The radio communication equipment according to claim 22 with which said application software is electronic mail software, and said memory storage memorizes an electronic mail file as said 1st and 2nd data files.
[Claim 28]The radio communication equipment according to claim 22 with which said application software is electronic mail software, and said memory storage memorizes a mail address as said 1st and 2nd data files.

[Translation done.]

PRIOR ART

[Description of the Prior Art]Now, several radio communications systems with which standards differ are intermingled with the explosive spread of radio communications systems. Generally radio communication equipment is prepared corresponding to each radio communications system, respectively. It is also required that the latest mobile radio communication equipment can respond to various application services called not only the voice call from the former but an E-mail, data communications, and browsing of Web (world wide web). Therefore, the demand what is called to a multi-mode terminal unit which can respond to two or more radio communications system and various application services by one set is increasing.
[0003]The software walkie-talkie is proposed as a way method for realizing a multi-mode terminal unit. In a software walkie-talkie, software processing realizes at least a part of signal processing required for transmission and reception using a programmable device like DSP (digital signal processor). By replacing software, the software walkie-talkie can be equivalent to various radio communications systems, and can respond to various application services. For example, it is possible to shift to data communications from a voice call, or to carry out the hand-off of the radio communications system to a cdma2000 system from a W-CDMA system. Although the fundamental idea of such a software walkie-talkie is known by JP,H9-331579,A and others, for example, the indication about how equipment is realized in consideration of various situations is insufficient.
[0004]For example, in the radio communications system, improvement in the speed of the rate of the digital information transmitted is attained, and the standard change accompanying it is made frequently. It is necessary to perform design development of a software walkie-talkie at every standard change of this. It is also severe spec. [like processing delay] of the portion which treats a baseband signal among software walkie-talkies, and what is called a modem section it are, which has many throughputs and which is demanded. For this reason, a change of design is performed to the degree of the standard change of a radio communications system

at a modem section. The programmable device mentioned above can respond to such a change of design flexibly by change of software. However, the capability of a programmable device like DSP may be insufficient for the high speed processing of broadband wireless signal transmission.

[0005]In order for a software walkie-talkie to correspond to various radio communications systems and application services by the change of software, many resources which a terminal unit has are occupied. In order to correspond to a new radio communications system or to add an application service function, it is necessary to prepare a required empty resource. It also needs to be resource managed for distributing one resource the optimal because of a radio communications system or communications service. Since a miniaturization and low power consumption are required and resource quantity is especially restricted with the mobile radio communication equipment for mobile communications, resource management is important. A resource refers to the throughput of hardwares, such as processors, such as CPU and DSP, and a memory, and a processor, etc.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the radio communication equipment which can be equivalent to two or more radio communications systems.
[0002]
[Description of the Prior Art]Now, several radio communications systems with which standards differ are intermingled with the explosive spread of radio communications systems. Generally radio communication equipment is prepared corresponding to each radio communications system, respectively. It is also required that the latest mobile radio communication equipment can respond to various application services called not only the voice call from the former but an E-mail, data communications, and browsing of Web (world wide web). Therefore, the demand what is called to a multi-mode terminal unit which can respond to two or more radio communications system and various application services by one set is increasing.
[0003]The software walkie-talkie is proposed as a way method for realizing a multi-mode terminal unit. In a software walkie-talkie, software processing realizes at least a part of signal processing required for transmission and reception using a programmable device like DSP (digital signal processor). By replacing software, the software walkie-talkie can be equivalent to various radio communications systems, and can respond to various application services. For example, it is possible to shift to data communications from a voice call, or to carry out the hand-off of the radio communications system to a cdma2000 system from a W-CDMA system. Although the fundamental idea of such a software walkie-talkie is known by JP,H9-331579,A and others, for example, the indication about how equipment is realized in consideration of various situations is insufficient.
[0004]For example, in the radio communications system, improvement in the speed of the rate of the digital information transmitted is attained, and the standard change accompanying it is

made frequently. It is necessary to perform design development of a software walkie-talkie at every standard change of this. It is also severe spec. [like processing delay] of the portion which treats a baseband signal among software walkie-talkies, and what is called a modem section it are, which has many throughputs and which is demanded. For this reason, a change of design is performed to the degree of the standard change of a radio communications system at a modem section. The programmable device mentioned above can respond to such a change of design flexibly by change of software. However, the capability of a programmable device like DSP may be insufficient for the high speed processing of broadband wireless signal transmission.

[0005]In order for a software walkie-talkie to correspond to various radio communications systems and application services by the change of software, many resources which a terminal unit has are occupied. In order to correspond to a new radio communications system or to add an application service function, it is necessary to prepare a required empty resource. It also needs to be resource managed for distributing one resource the optimal because of a radio communications system or communications service. Since a miniaturization and low power consumption are required and resource quantity is especially restricted with the mobile radio communication equipment for mobile communications, resource management is important. A resource refers to the throughput of hardwares, such as processors, such as CPU and DSP, and a memory, and a processor, etc.

[0006]

[Problem to be solved by the invention]In the general design concept of mobile radio communication equipment, assignment of a resource is made fixed to two or more signal processing. Since the walkie-talkie must correspond to two or more radio communications system and two or more application services if this thought is applied to a software walkie-talkie, the utilization efficiency of a resource falls remarkably. It mainly specializes in the resource management looked at by the computer in the memory area, and no consideration is made about the resource management according to the resource management and wireless quality on the basis of a hardware space.

[0007]In a software walkie-talkie, a software module is downloaded through a communication line and it saves at memory storage as indicated, for example to JP,H9-331579,A. Since a software walkie-talkie corresponds to new communications service, if download of a software module is repeated, the quantity of the module saved at memory storage will increase. Since the capacity of the memory storage in a walkie-talkie is limited, it is necessary to delete an unnecessary module out of the already saved module in download actually. It must also take into consideration updating the module saved at memory storage corresponding to modular upgrade. It is inefficient to determine the module which should be deleted or updated with reference to the modular name and version in memory storage for modular deletion or

updating. Realization of the mechanism of managing a module efficiently is desired.
[0008]Generally in application of various kinds mentioned above which a software walkie-talkie can treat, carrying out the menu indication of a list of Web pages in which browsing is done by user of a walkie-talkie, and a telephone number of this user's specific communications partner and a list of e-mail addresses is performed. However, generally, with a software walkie-talkie which can be equivalent to two or more radio communications systems, if a radio communications system to adapt is changed, a file of these lists cannot be used. A radio communications system provides a browser and an e-mail system by original application service which a communications service company which employs this system, respectively defined, respectively, and original specification.
[0009]In order that specifications of application service may differ for every radio communications system, a list file of a Web page, a telephone number, and a mail address must be prepared for every radio communications system. It is because a file format used by application service with the Reason peculiar to each radio communications system is a form peculiar to the application service. Therefore, in a software walkie-talkie, a list file of a Web page described by a certain file format which carried out radio communications system correspondence, a telephone number, and an e-mail address cannot be diverted to other radio communications systems. The user of a software walkie-talkie has to re-create newly a list file for application services of the radio communications system, if a radio communications system to be used is changed. Furthermore, there is inconvenience that the user concerned must be alike according to two or more radio communications systems which may be used, and those list files must be managed.
[0010]The purpose of this invention is to provide radio communication equipment which performs resource management of a signal processing device exactly and efficiently.
[0011]
[Means for solving problem]In order to solve above-mentioned SUBJECT, radio communication equipment applicable to two or more radio communications systems concerning the 1st mode of this invention is provided with the following.
A radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received.
A signal processing device constituted so that this resource might manage at least one modem function and a protocol function including a resource with which a function was defined and this resource might perform required signal processing with said transmission and reception.
A controller which supplies other modem functions and protocol functions respectively corresponding to said radio communications system to said signal processing device that it should redefine to said resource.

[0012]Radio communication equipment applicable to two or more radio communications systems concerning the 2nd mode of this invention is provided with the following.
A radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received.
A signal processing device constituted including a resource which can redefine a signal processing function so that this resource might perform signal processing of a required predetermined function with said transmission and reception.
A controller which controls said signal processing device according to resource quantity required to define a signal processing function newly required of said resource, and surplus resource quantity that said signal processing function newly demanded should be defined as said resource.

[0013]Radio communication equipment applicable to two or more radio communications systems concerning the 3rd mode of this invention is provided with the following.
A radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received.
A signal processing device constituted so that this resource might perform signal processing of a required predetermined function with said transmission and reception including a resource which can redefine a signal processing function according to a predetermined software module.
Memory storage constituted so that two or more software modules which corresponded to said two or more radio communications systems, respectively might be memorized.
a controller which controls said signal processing device and memory storage in order to read at least one software module corresponding to a predetermined radio communications system with which said radio communication equipment is applied from said memory storage and to give this software module that carried out reading appearance to said resource.

[0014]Radio communication equipment applicable to two or more radio communications systems concerning the 4th mode of this invention, A resource which can redefine a signal processing function is included according to a radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received, and a predetermined software module, A signal processing device constituted so that this resource might perform signal processing of a required predetermined function with said transmission and reception, Two or more software modules which corresponded to two or more signal processing functions which can be carried out by said signal processing device, respectively, Memory storage constituted so that a table which recorded a using history of each of this software module at least might be memorized, At least one software module corresponding to a signal processing

function which should be made to perform to said signal processing device is read from said memory storage, this software module that carried out reading appearance is given to said signal processing device, and a controller which controls said signal processing device and memory storage is provided in order to rewrite further at least one software module memorized by said memory storage with reference to said table.

[0015]Radio communication equipment applicable to two or more radio communications systems concerning the 5th mode of this invention is provided with the following.

The radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received.

The signal processing device constituted so that this resource might perform signal processing of a required predetermined function with said transmission and reception including the resource which can redefine a signal processing function according to a predetermined software module.

Two or more software modules which corresponded to two or more signal processing functions which can be carried out by said signal processing device corresponding to two or more radio communications systems which can apply said radio communication equipment, respectively.

Two or more 1st data files that have a file format corresponding to the peculiar application software prepared to each of each of said radio communications system, respectively, And memory storage constituted so that the 2nd data file with common file form might be memorized, The 1st conversion method for performing this conversion in order to change into said 2nd data file 1st at least one data file memorized by said memory storage and to newly store it in said memory storage, The 2nd conversion method for changing into said 1st at least one data file 2nd at least one data file memorized by said memory storage, the controller which controls said signal processing device and memory storage in order to read the software module corresponding to one predetermined radio communications system with which said radio communication equipment is applied from said memory storage and to give this software module that carried out reading appearance to said signal processing device.

[0016]

[Mode for carrying out the invention](A 1st embodiment) If drawing 1 (a) is referred to, in the mobile radio communication equipment according to this embodiment, RF (high frequency) signal from the base station which is not illustrated via the antenna 1 will be received, and the RF signal to this base station will be transmitted. The input signal from the antenna 1 is changed into a digital receiving IF (intermediate frequency) signal by the radio-transmission-and-reception device 2, and is supplied to the signal processing device 3 by it. The digital transmitting IF signal generated by the signal processing device 3 is changed into a transmitting RF signal by the radio-transmission-and-reception device 2, and is supplied to the

antenna 1 by it.

[0017]Including LSI-ized hardware resources, such as a processor, a memory, and a logical circuit, the signal processing device 3 mainly performs processing of the modem unit 3A required for transmission and reception, and the protocol 3B, as shown in drawing 1 (b). The specification of the modem unit 3A and the protocol 3B, Concerning [for example,] a W-CDMA (Wide band code-division multiple access) system, It defines as TS 25 series of 3rd Generation Partnership Project (3GGP™), GSM (Global system for mobile communications) is defined by TS 05 series of 3GGP™.

[0018]Processing of the modem unit 3A (called a baseband unit) is signal processing in the field (baseband area) near the radio-transmission-and-reception device 2. More specifically, processing of the modem unit 3A is the processing which restores to sampled IF (intermediate frequency) signal which was digitized, and generates a receiving baseband signal and the processing which modulates send data and generates a transmitting berth band signal which are outputted from the radio-transmission-and-reception device 2. Processing of the protocol unit 3B (called L2 / L3 protocol unit) is the protocol processing for which it opted according to the radio communications system with which mobile radio communication equipment is used.

[0019]The resource which the signal processing device 3 has is controlled by the resource controller 4. By this control, it can conform to the function of mobile radio communication equipment and the change of specification accompanying change of a service condition, and realization of the handover control accompanying movement between the radio communications systems which change with them is enabled easily. Specifically, the function of mobile radio communication equipment is changed into a request by performing change control of software, change control of a logical-circuit constitution method, or control of the both to the resource of the signal processing device 3 by the resource controller 4. Thus, by the resource which the signal processing device 3 has by the resource controller 4 being controlled accommodative, this resource with which quantity was restricted is used effectively.

[0020]A field which performs processing for which software processing is sufficient in capability among resources of the signal processing device 3, A field where a general-purpose processor and a memory realize and a process speed is demanded is realized in hardware circuitry like DSP (digital signal processor) or PLD (programmable logic device). DSP is a basis of control from the resource controller 4, and performs desired signal processing according to a program read from the memory storage 5. PLD is a basis of control from the resource controller 4, and processes a request by describing circuitry according to a program read from the memory storage 5.

[0021]Databases, such as processed data and a telephone directory like software (module which is a component of a program and a program) used for the memory storage 5 with the signal processing device 3, and received data and send data, and an address book, are held.

The memory storage 5 performs read/write of a required program or data by control from the resource controller 4 or the system controller 6 which controls the whole inside of mobile radio communication equipment. A program read from the memory storage 5 is described by the signal processing device 3. As the memory storage 5, a small hard disk drive apparatus or semiconductor memory like FROM is used.

[0022]The input-and-output device unit 7 connected to the system controller 6 includes a loudspeaker, a keyboard, and a display for a microphone for various kinds of I/O devices which manage an interface with a user of mobile radio communication equipment, for example, voice input, and voice response. A keyboard is used for a dialing key, function key operation, text input, editing operation, etc. Incoming information, contents, a menu, etc. are expressed as a display. The input-and-output device unit 7 has a USB interface for performing serial input/output between an MPEG interface which performs video compression elongation processing further, and an external device. These components of the input-and-output device unit 7 are connected by an internal bus, and an internal bus is connected to the system controller 6.

[0023]An example of concrete composition of the radio-transmission-and-reception device 2 in drawing 1 is shown in drawing 2. Explanation of a receiving system will lead RF input signal from the antenna 1 to the low noise amplifier 11 with the transmission-and-reception changeover switch (or duplexer) 10. an RF signal with which even a necessary level was amplified by LNA11 should pass BPF(band pass filter)12 -- it is inputted into the mixer 13 and a down convert is carried out by being mixed with 1st local signal LO11 for reception from the frequency synthesizer 20 here. An output signal from the mixer 13 is inputted into the mixer 16 through IF amplifier 14 and the band bus filter 15, and a down convert is carried out to a necessary intermediate frequency by being mixed with 2nd local signal LO12 for reception from the synthesizer 20 here. An output signal from the mixer 16 is inputted into A/D converter 18 through the low pass filter 17, and is changed into digital IF signal 19. IF signal 19 is inputted into the signal processing device 3.

[0024]In a transmission system, a digital IF signal outputted from the signal processing device 3, After being changed into an analog signal by D/A converter 22, it is inputted into the mixer 24 through the low pass filter 23, and upconverting is carried out by being mixed with 1st local signal LO21 for transmission from the synthesizer 20 here.

[0025]An output signal from the mixer 24 is inputted into the mixer 27 through the band bus filter 25 and IF amplifier 26, and upconverting is carried out to necessary RF frequency by being mixed with 2nd local signal LO22 for transmission from the synthesizer 20 here. After an RF output signal from the mixer 27 is amplified with the power amplifier 29 through the band pass filter 28, it is led to the antenna 1 by the switch 10, and is emitted as an electric wave from the antenna 1.

[0026]The signal processing device 3 in drawing 1 (a) includes the general-purpose processor (CPU) 31, the signal processing unit 32 (SPU), the memory 33, and the input/output interface 34, as shown, for example in drawing 3 (a). CPU31 performs processing according to a program given beforehand, and transmits a predetermined command and data to SPU32, and makes advanced signal processing perform to SPU32. On the contrary, CPU31 can change the contents of processing according to a command or a trigger from SPU32.
[0027]The signal processing function of CPU31 and SPU32 is defined by installing a program in CPU31 and SPU32 by the resource controller 4. An assignment of the processing which CPU31 and SPU32 should perform is determined by the resource controller 4. In drawing 3, although it is described that the resource controller 4 is realized by the program which operates on CPU31, the sequencer on DSP or a logical circuit may also be realized.
[0028]SPU32 is the programmable exclusive processor which specialized in signal processing, and either [at least] DSP or PLD is specifically used. SPU32 performs signal processing, using the memory 33 as a work memory. SPU32 performs the output of the signal with which the signal of the processing object was inputted and processed via the external interface 34 between the radio-transmission-and-reception device 2 and the system controller 6. As an example of the concrete contents of processing which SPU32 performs, "correlation operation", a "complex operation", "maximum detection", "the address translation of a memory", a "sequencer", "high-speed radial transfer", "accumulation", a "function operation", etc. are mentioned.
[0029]A case where a radio signal processing unit according to this embodiment is applied to a CDMA (code-division multiple access) system is explained concretely. A resource (back diffusion circuit resource) which performs back-diffusion-of-gas processing in a CDMA system to both SPU32 and CPU31 [SPU32 in the signal processing device 3 or], for example, becomes it from two or more logical circuits is prepared. This resource is controlled by the resource controller 4. In a CDMA system, a function of a RAKE receiver which operates to finger timing according to multipass transmission, and a function which searchs finger timing periodically are needed. A search of finger timing is performed in consideration of mobile communications environment where multipass timing is changed. Both these functions of both are realized by back diffusion circuit including a correlation circuit, and a separate back diffusion circuit is assigned to both functions fixed in the former.
[0030]If this embodiment is followed, it is easy to be a constant period or to use for search processing a back diffusion circuit resource used for RAKE receiving by the resource management by the resource controller 4, at any time according to communication quality etc. If it carries out like this, quality communication will be secured by less circuit structure. In a CDMA receiver which receives two or more code channels, a back diffusion circuit resource is assigned to each channel by the resource management by the resource controller 4 according

to connection/cutting of a code channel. If it carries out like this, a limited back diffusion circuit resource can realize RAKE receiving of a multiple channel, and it will become possible to reduce circuit structure.

[0031]SPU32 is constituted including two or more DSP37A and 37B, and PLD38, and these are connected by the internal bus 39 so that it may be illustrated by drawing 3 (b). DSP37A and 37B, and PLD38 can perform both processings of a back diffusion circuit resource. the case of this composition -- DSP37A and 37B, and PLD38 -- each throughput which it has, or a MIPS value corresponds to a part of resource of the signal processing device 3. In the example of a CDMA system, supposing the throughput of one back diffusion circuit is 10 [MIPS], DSP with the throughput of 100 [MIPS] can be treated as the same back-diffusion-of-gas resource as ten back diffusion circuits.

[0032]In order to realize the functions (RAKE receiving, a multipass search, peripheral cell search, multi-channel reception, etc.) of the mobile radio communication equipment applied to a CDMA system, the resource controller 4, The total resource which the signal processing device 3 has is assigned so that the resource which DSP37A and 37B have may be applied to the total function of which it is required at the time. For example, when the resource which is total and is equivalent to 15 back diffusion circuits is required, PLD38 is made to pay the capability of ten back diffusion circuits, and the equivalent throughput of 100 [MIPS], and DSP37A or 37B is made to pay the capability of remaining five back diffusion circuits, and the equivalent throughput of 50 [MIPS]. The resource allocation of the signal processing device 3 is not restricted at the time of use with the same radio communications system. For example, a CDMA system and a TDMA (time-division multiple access) system, There are a TDMA system, an FDMA (frequency-division multiple access) system and an FDMA system, a CDMA system, and a processing element common then respectively. Resource allocation of the signal processing device 3 can be performed like the above about the processing which does not compete in time in common between these different **** radio communications systems.

[0033]Since reconstruction of a function is possible for mobile radio communication equipment according to this embodiment with high flexibility as mentioned above, costs and development cycles required for a functional addition are reduced. A function of the modem unit 3A shown by drawing 1 (b) contained in the signal processing device 3 and the protocol unit 3B is required in the case of reconstruction of a function of mobile radio communication equipment. Thus, by carving a function of the signal processing device 3 into the modem unit 3A and the protocol unit 3B, it becomes easy to share same function with two or more radio communications systems.

[0034]It is useful that a function of the modem unit 3A shown by drawing 1 (b) contained in the signal processing device 3 and the protocol unit 3B is freely reconstructible, when moved and used between service areas of a radio communications system with which these mobile radio

communication equipment differs. That is, according to a receive state of an electric wave and a congestion degree of a radio channel in a movement destination, mobile radio communication equipment can choose an available radio communications system the optimal, and can communicate under the selected system. Roaming and a handover become possible easily by this.

[0035]As shown in drawing 4, the general-purpose processor (CPU) 31 functions as the program sequencer (PS) 41 which manages program execution, and the arithmetic operation unit (ALU) 42. The signal processing unit (SPU) 32 shown in drawing 3 (a) performs a signal place according to a start or the sequence ended or programmed of processing by self, and supplies a trigger signal or an interrupt signal to CPU31. The trigger signal or interrupt signal supplied to CPU31 is detected by PS41. By this, CPU31 can recognize the state of SPU32, for example, "an end of signal processing", and can change the contents of processing of ALU42 based on the recognition. Thus, it becomes possible by carrying out coordination operation of CPU31 and SPU32, and making processing share with each to perform a complicated operation at high speed.

[0036]As shown in drawing 5, SPU32 has the arithmetic and logic unit (ALU) 51, the instruction memory 52, the data memory 53, and the input/output interface 54. ALU51 performs advanced signal processing, such as "correlation operation", "complex number operation", "array conversion", "maximum detection", "memory address conversion", a "sequencer", and "high-speed input and output", according to input data from the outside, data in the memory 33, and a processing instruction and data from CPU31. A processing result from ALU51 is written in a memory in data memory 33 and CPU31, a register and the memory 33, and the input/output interface 34. Thus, when a burden is performed about heavy advanced signal processing by SPU12 which is an exclusive processor for processing by CPU11, a burden of CPU11 is eased and processing speed improves.

[0037]An address conversion circuit for SPU32 is shown in drawing 6. An address conversion circuit is constituted by the two address decoders 61 and 62 of the memory 60, and necessary conversion patterns are written in, respectively. One side of the address decoders 61 and 62 is chosen with the command from SPU32, and the contents of decoding are changed. The register group 63 in the memory 60 is a memory cell in a memory like RAM (random access memory). It reads with a write-in address decoder with which the usual RAM is equipped, and the contents of decoding of an address decoder are the same. Therefore, if it is going to realize a bit array conversion process like bit interleave contained in processing of SPU32 by the usual RAM, it is necessary to perform address computation for every read-out.

[0038]If according to drawing 6 the address decoders 61 and 62 are read with a write-in address decoder, respectively and it is used for an address decoder, such address computation becomes unnecessary and a conversion process like interleave with dramatically

many throughputs can be performed at high speed. The address decoders 61 and 62 may be used as a device rewritable, respectively for example, like RAM, and an address mapping table may also be written in these. Since it can respond to two or more conversion patterns by this, the flexible processing corresponding to various patterns is realizable with simple composition.

[0039]As shown in drawing 3 (a), the data between CPU31 and SPU32 can also be direct delivered and received via the register array 36 in CPU31. Direct access of the register array 36 is carried out from SPU32. That is, SPU32 can write the data output from self in the register array 36 directly, and can also read data from the register array 36 directly. CPU31 can incorporate the contents of the register array 36, and can write data in the register array 36.

[0040]Thus, if the register array 36 is used for data transfer of CPU31 and SPU32, CPU31 should just access the register array 36 regardless of an operation situation of SPU32 in data transfer. Therefore, data transfer processing in CPU31 can be made quick, and processing of the signal processing device 3 can be accelerated.

[0041]Operation in a case of processing with the signal processing device 3 shown in drawing 3 (a) in response to a receiving IF signal digitized from the radio-transmission-and-reception device 2 with the input/output interface 34 is explained. If it is going to deal with an input signal only by CPU, many of arithmetic proficiency of CPU will be spent only by radial transfer, and only the remaining capability of CPU can be assigned to other processings. According to the signal processing device 3 shown in drawing 3 (a), throughput of CPU31 can be put in making SPU32 carry out radial transfer without CPU31 to processing of those other than radial transfer using the register array 36.

[0042]The receiving IF signal incorporated into the input/output interface 34 is incorporated into SPU32 one by one, and if fixed processing is required, necessary signal processing will be performed by SPU32. The processing result from SPU32 is written in the memory 33 or the register array 36. CPU31 performs required processing using the data written in the memory 33 or the register array 36.

[0043]Thus, the load of CPU31 can be made to reduce by making radial transfer and signal processing share with SPU32. In other words, signal processing high-speed as the signal processing device 3 whole is realized by making CPU31 and SPU32 distribute the processing load of the signal processing device 3. In order to plan much more load sharing, two or more CPUs are provided and it may be made to make each CPU distribute the processing made to share with CPU31 of drawing 3 (a).

[0044]Hereafter, other embodiments of this invention are described. In following embodiments, the fundamental composition of mobile radio communication equipment is the same as that of a 1st embodiment, and indicates other variations about the component or the mode of operation of mobile radio communication equipment.

[0045](A 2nd embodiment) The signal processing device 3 shown in drawing 7 has the circuitry description memory 71, the program sequencer 72, the programmable hardware device 73, and the memory 74. The programmable hardware device 73 is the hardware which can redefine circuitry, such as PLD and FPGA (fieldprogrammable gate array), and is an aggregate of various logical circuits which perform a fundamental operation of signal processing. The programmable hardware device 73 may be a device which realizes a necessary processing capability as change being programmably possible in combination of various logical circuits with a switch.

[0046]Circuitry description according to contents of processing for realizing a necessary signal processing function by combining programmably various logical circuits in the programmable hardware device 73 with the circuitry description memory 71 is held. A program which shows a procedure of processing which the programmable hardware device 73 is made to perform is stored in the memory 74.

[0047]The program sequencer 72 receives a resource management program from the resource controller 4, A program is suitably read from the memory 74, the circuitry description memory 71 and the programmable hardware device 73 are controlled according to it, and the programmable hardware device 73 is made to perform signal processing according to this program.

[0048]In processors, such as general CPU and DSP, circuitry of an ALU portion of the inside is immobilization. A dedicated communication circuit corresponding to each instruction set is constituted as ALU so that the contents of processing by an instruction set in which this processor was given can be realized. On the other hand, processing usually performed by ALU is realized in this embodiment by the programmable hardware device 73 which can redefine circuitry.

[0049]A circuitry description required to realize processing of a request to the programmable hardware device 73 is stored in the circuitry description memory 71 as a program. More specifically in the circuitry description memory 71. Fundamental processing called "4 Rule operation", "data transfer", and a "bit shift" which are contained in usual ALU is added to circuitry description for realizing by hardware, For example, a program which shows circuitry description, such as "correlation operation processing", "complex multiplication processing", "maximum detection processing", an "absolute value operation", for the usual processor to realize plural steps or ******** processing by hardware and circuitry description which shows combination of elementary operation processing is stored. Whenever a signal processing function of the signal processing device 3 is newly defined by using such a circuitry description memory 71, circuitry description of the programmable hardware device 73 is changed so that the signal processing function can be realized.

[0050]Many programs for the above circuitry description to be performed to the memory 71 are

described by the program area 74A on the memory 74. A required program is read from the block area 74A under control of the program sequencer 72, and it is given to the circuitry description memory 71. The circuitry of the programmable hardware device 73 is redefined by this.

[0051]Thus, according to this embodiment, processing of the signal processing device 3 is realized by the programmable hardware device 73 which can redefine circuitry. Therefore, in the usual processor which performs software processing, processing which also needs tens - hundreds steps can be performed at high speed within a number cycle, and, moreover, it can respond to the definition of various signal processing functions flexibly.

[0052](A 3rd embodiment) As for the signal processing device 3 shown in drawing 8, in addition to drawing 7, CPU75 is added. The circuitry description memory 71, the program sequencer 72, the programmable hardware device 73, and the memory 74 are fundamentally [as what was explained by drawing 7] the same. However, complicated signal processing defined further beforehand is made to carry out the program sequencer 72 to the ** programmable hardware device 73 just here, It has a function which chooses a device corresponding to the contents of processing in order to make CPU75 carry out about the usual signal processing, and the function to perform control which operates programmable hardware device 73 and CPU75 simultaneously, and performs parallel processing.

[0053]In signal processing of the modem unit 3A especially shown in drawing 1 (b) of the signal processing device 3, By executing the resource management program from the resource controller 4 by the program sequencer 72, According to the signal processing function which should have the signal processing device 3, an assignment of the processing which programmable hardware device 73 and CPU75 should perform, respectively is determined. Circuitry description chosen from the memory 71 according to this determination is given to the programmable hardware device 73. Simultaneously, directions of the enforcement about the processing made to share with CPU75 from the program sequencer 72 are given to CPU75.

[0054]Signal processing in which it is complicated for CPU75 and a burden is heavy is performed by the above control by the program sequencer 72 with the programmable hardware device 73 which is a processor only for signal processing, and other processings are performed by CPU75 by it. Therefore, the time which the high speed processing of becomes possible, and can respond easily also to the signal processing function and change of design which should moreover have the signal processing device 3, and the new product development of mobile radio communication equipment takes is shortened.

[0055](A 4th embodiment) The signal processing device 3 shown in drawing 9 differs from composition which having the two programmable hardware devices 73A and 73B showed to drawing 7. A function to perform control which makes processing share with these

programmable hardware devices 73A and 73B is added to the program sequencer 72. It becomes possible to be able to change a processing capability of the signal processing device 3 with higher flexibility, and to perform more complicated signal processing by having such composition. Composition of this embodiment may be extended and it may have three or more programmable hardware devices.

[0056]The signal processing device 3 shown in drawing 9 is shown in drawing 10 still more concretely. To the program areas 74A and 74B in the memory 74, the program memory 80 and the data memory 81. The control circuit 92 corresponds to the program sequencer 72, the circuit description memory 83 is equivalent to the circuitry description memory 71, and SPU84 corresponds to the programmable hardware device 73, respectively.

[0057]The command and data from the resource controller 4 or the system controller 6 in an external device (a), i.e., drawing 1, It is incorporated in the signal processing device 3 via the input register group 85, and the register group 86 is passed, it is held temporarily, it is sent out to the output register group 87, and SPU84 is passed.

[0058]It is assumed that the following processing programs are stored in the program memory 81, for example.

a=A+B (i)b=CxD (ii)(a, b) =(A, B) * (C, D) (iii) -- processing program (i), (ii), and (iii) of these express addition, multiplication, and complex multiplication, respectively. X of (X, Y) and Y express the element of the real part of a complex number, and an imaginary part, respectively. * Express complex multiplication.

[0059]In the circuitry description memory 83, the circuitry description for realizing each operation is recorded, According to the contents of the program stored in the program memory 80, the control circuit 82 is accessing the circuitry description memory 83, and rewrites circuitry description of SPU84 which is a programmable hardware device. Therefore, in the example of an above-mentioned processing program, an adder circuit, a multiplication circuit, and a complex multiplication circuit are formed in SPU84. Signal processing which SPU84 bears is not restricted to four operations, but any processings are possible for it if circuitry description is possible for correlation operation, the maximum, a minimum judging, etc. Since the processing efficiency by rearranging to the hardware organization only for the processing improves so that it is very complicated processing, much more high speed processing effect is enjoyed.

[0060](A 5th embodiment) drawing 11 -- being shown -- having -- as -- this invention -- the -- five -- an embodiment -- following -- a signal processing device -- three -- a hardware resource -- ****** -- a signal processing function -- redefinition -- being impossible -- a field -- three -- A -- being possible -- a field -- three -- B -- and -- a switch unit -- (-- SW --) -- 110 -- having . The logical circuit frequently used for the redefinition impossible field 3A, For example, the CRC addition (attach) block 101, the CRC-check block 102, Viterbi decoder 103, the turbo decoder 104, the correlator 105, the accumulator 106, the demodulator 107, and the deinterleaver 108

are mounted. The redefinition feasible region 3B comprises two or more PLD109 which are a component of FPGA. The switch unit 110 changes the connection between the field 3A and the field 3B, and connection of each block in the field 3B by control from the resource controller 4.

[0061]The connection state corresponding to a certain single radio communications system realized by the change of the switch unit 110 of the signal processing device 3 shown in drawing 11 is shown in drawing 12 and drawing 13. The input signal inputted into the signal processing device 3 is inputted into the correlator 105 and the demodulator 07, and the output signal from the correlator 105 is inputted into the accumulator 106. The output signal from the accumulator 106 is inputted into the demodulator 107. The output signal from the demodulator 107 is made into the output signal of the signal processing device 3 via the deinterleaver 108, Viterbi decoder 103, and the CRC-check block 102. In drawing 13, the equalizer 111 by which function assignment was carried out to PLD109 is further added to drawing 12. An input signal is inputted into the demodulator 107 via the equalizer 111.

[0062]An example of wire connection whose correspondence in two radio communications system A of the signal processing device 3 and B was enabled is shown in drawing 14. The demodulator 107 is used in common with both systems A and B. Also in any of the systems A and B, an output signal from the demodulator 107 is inputted into the deinterleaver 108, and an output signal from the deinterleaver 108 is inputted into Viterbi decoder 103 in the system A, and it is inputted into the turbo decoder 104 in the system B, respectively. An output signal from Viterbi decoder 103 and the turbo decoder 104 is made into an output signal of the signal processing device 3 via the CRC-check block 102.

[0063]Resource size of the signal processing device 3 differs from size of the fields 3A and 3B for every mobile radio communication equipment. In mobile radio communication equipment in which some application service functions were installed, many signal processing functions are already defined as a resource of the signal processing device 3. Surplus resource quantity of the signal processing device 3 changes every moment according to an operating condition of mobile radio communication equipment.

[0064]The resource controller 4, The operating condition of the buffer 133 for storing temporarily the resource management table 130, the resource manager 131, the replacement system 132 that updates the resource of the signal processing device 3, and various kinds of data, as shown in drawing 15, and the resource of the signal processing device 3. It has the resource monitor system 34 for monitoring.

[0065]The resource manager 131 updates the resource management table 130 which is an operating condition list of resources based on the monitored result from the resource monitor system 34. The resource manager 131 grasps the surplus resource quantity of the redefinition feasible region 3B of the signal processing device 3 based on the monitored result from

referring to the resource management table 130 or the resource monitor system 34.

[0066]The resource manager 131 grasps the resource quantity needed in the redefinition feasible region 3B, in order to carry out this functional definition to the resource of the signal processing device 3 based on the composition descriptive information for realizing the new signal processing function by which an additional definition is carried out. In the resource manager 131, the new additional definition of a signal processing function to the redefinition feasible region 3B of the resource of the signal processing device 3 is performed using the update-of-resources device 132 according to this necessary resource quantity and surplus resource quantity.

[0067]According to this embodiment, even if it is in environment where a resource of the signal processing device 3 to own differs from an operating condition of a resource, for every mobile radio communication equipment, according to an operating condition of a resource which changes every moment, it becomes possible to add a new signal processing function efficiently. That is, optimum allocation of a resource becomes possible by adding a new signal processing function using information on a situation of a resource which oneself has already used.

[0068]Composition of a radio communications system which contained the mobile radio communication equipment 10 according to this embodiment as a terminal is shown in drawing 16. In this radio communications system, the composition descriptive information providing device 140 exists in a base station. The composition descriptive information providing device 140 provides the mobile radio communication equipment 10 with information (henceforth composition descriptive information) which described composition of a signal processing function by which an additional definition should be carried out to a resource of the signal processing device 3 in the mobile radio communication equipment 10.

[0069]In this example, the composition descriptive information providing device 140 has the buffer 143 for saving the antenna 141, the radio-transmission-and-reception device 142, and composition descriptive information, in order to provide the mobile radio communication equipment 10 with composition descriptive information by radio. Communication between the mobile radio communication equipment 10 and the composition descriptive information providing device 140 may be a cable. For example, what is necessary is just to use the composition descriptive information providing device 140 as equipment which performs the renewal of a function in a service center which updates a function of the mobile radio communication equipment 10.

[0070]The mobile radio communication equipment 10 has the antenna 1, the radio-transmission-and-reception device 2, the signal processing device 3, the resource controller 4 memory storage 5, the system controller 6, and the input-and-output device unit 7, as shown in drawing 1. The resource controller 4 has the resource monitor system 34 for monitoring an

operating condition of a resource of the resource management table 130, the resource manager 131, the update-of-resources system 132, the buffer 133, and the signal processing device 3, as shown in drawing 15.

[0071]In the composition descriptive information providing device 140, composition descriptive information corresponding to a signal processing function newly added to the radio communication equipment 10 is read from the buffer 143. Read composition descriptive information is transmitted towards the mobile radio communication equipment 10 by the radio-transmission-and-reception device 142. Composition descriptive information which was transmitted to the mobile radio communication equipment 10, and came is received by the radio-transmission-and-reception device 2. In the resource controller 4, necessary resource quantity for the signal processing device 3 to realize a desired signal processing function is grasped based on received composition descriptive information. In the resource controller 4, surplus resource quantity for which the signal processing device 3 is not used is grasped based on an operating condition of a resource currently monitored by the resource monitor system 134. The resource controller 4 performs optimal resource allocation to a signal processing function by which an additional definition should be carried out at a resource of the signal processing device 3 according to such necessary resource quantity and surplus resource quantity.

[0072]Other composition of the radio communications system having contained the mobile radio communication equipment 10 according to this embodiment is shown in drawing 17. In addition to the antenna 141, the radio-transmission-and-reception device 142, and the buffer 143 which were explained by drawing 16, the composition descriptive information providing device 140 has the resource controller 144 further. When the additional definition of the signal processing function new to the resource of the signal processing device 3 in the mobile radio communication equipment 10 should be carried out, The information which shows the operating condition of the resource of the signal processing device 3 currently monitored by the resource monitor system 134 is transmitted to the composition descriptive information providing device 140 via the antenna 1 by the radio-transmission-and-reception device 2.

[0073]In the composition descriptive information providing device 140, the composition descriptive information which shows the signal processing function which should newly be carried out an additional definition to the signal processing device 3 is read from the buffer 143. Based on this composition descriptive information, the necessary resource quantity for carrying out the additional definition of the signal processing function new to the resource of the signal processing device 3 by the resource controller 144 is grasped. In the resource controller 144, the surplus resource quantity of the signal processing device 3 is grasped based on the operating condition of the resource currently monitored by the resource monitor system 134. According to such necessary resource quantity and surplus resource quantity, the

resource controller 144 asks the resource of the signal processing device 3 for the optimal resource allocation to the signal processing function by which an additional definition is carried out by an operation, and outputs resource allocation directions information to it. This resource allocation directions information is transmitted to the mobile radio communication equipment 10 via the antenna 141 by the radio-transmission-and-reception device 142.

[0074]It is received by the radio-transmission-and-reception device 2 via the antenna 1, and resource allocation information transmitted to the mobile radio communication equipment 10 is passed to the resource controller 4. The resource controller 4 performs optimal resource allocation to a signal processing function by which an additional definition should be carried out at a resource of the signal processing device 3 according to resource allocation information. Thus, an operation for resource allocation is performed with the composition descriptive information providing device 140. That is, an operation needed in order to add a new signal processing function to a resource of the signal processing device 3 in the mobile radio communication equipment 10 is performed in the exterior of the mobile radio communication equipment 10. Since quantity of an operation performed by the resource controller 4 of the mobile radio communication equipment 10 decreases by this, it can contribute to low cost-ization of the mobile radio communication equipment 10. That is, when processing which resource allocation of the signal processing device 3 of a terminal requires is assisted by base station, a processing load of a terminal which resource allocation takes is reduced.

[0075]Operation of this embodiment is explained with reference to drawing 18 - drawing 20. If drawing 18 is referred to, the mobile radio communication equipment 10 will receive first composition descriptive information transmitted from the composition descriptive information providing device 140 (Step S101). In the mobile radio communication equipment 10, necessary resource quantity which an additional definition of a signal processing function to the signal processing device 3 takes by the resource controller 4 using received composition descriptive information is calculated (Step S102). Necessary resource quantity and resource quantity (initial resource quantity) which the signal processing device 3 has at the time of shipment of the mobile radio communication equipment 10 are measured (Step S103). When necessary resource quantity is larger than quantity of an initial resource, it is notified to the composition descriptive information providing device 140 that an additional definition of a signal processing function is impossible (Step S104).

[0076]When necessary resource quantity is smaller than initial resource quantity, in the resource controller 4, it grasps by the resource monitor system 134 (Step S105)., present operating condition, for example, surplus resource quantity, of a resource of the signal processing device 3 The amount of surplus sources and necessary resource quantity are measured, and it is judged to the signal processing device 3 whether an additional definition of a new signal processing function is possible (Step S106). When an additional definition is

possible, a new signal processing function is defined as a resource of the signal processing device 3 by the update-of-resources system 132 (Step S107). In Step S107, assignment of this resource of a signal processing function already defined as the signal processing device 3 is changed if needed. When an additional definition of a new signal processing function is impossible, that is notified to the composition descriptive information providing device 140 (Step S104). Processing of Step S103 may be omitted.

[0077]If drawing 19 is referred to, processing from Step S201 to S204 is the same as processings from step SS101 in drawing 18 to S104. In Step S205, it is grasped as alike with reference to the resource management table 130, present operating condition, for example, surplus resource quantity, of a resource of the signal processing device 3. In the following step S206, it is judged to the signal processing device 3 whether an additional definition of a new signal processing function is possible. When an additional definition is possible, by the update-of-resources system 132, a new signal processing function is defined as a resource of the signal processing device 3 (Step S207), and the resource management table 130 is updated in connection with it (Step S208).

[0078]According to drawing 20, it is the same as processing of Steps S206 and S207 with step SS201 [in / with Step S301 to S305 / in processing of Steps S307 and S308 / drawing 19] to S204. At drawing 20, after processing of step S305 **, before defining a new signal processing function as the resource of the signal processing device 3 at Step S307, renewal of the resource management table 130 is performed at Step S306.

[0079]As mentioned above, generally the resource sizes of the signal processing device 3 differ for each mobile radio communication equipment of every. In connection with this, the composition and size of the redefinition impossible field 3A and the redefinition feasible region 3B which were illustrated to drawing 11 also differ from each other for each mobile radio communication equipment of every. Therefore, in order to perform efficiently resource allocation to the signal processing function of the signal processing device 3, it is necessary to grasp the number etc. of the CRC additional block 101 in the details of the resource which the signal processing device 3 has, for example, drawing 11, and the CRC-check block 102.

[0080]In a radio communications system shown in drawing 17, the resource controller 144 is formed in the composition descriptive information providing device 140 which are equipment other than mobile-radio-communication-equipment 10 which has the signal processing device 3. In this resource controller 144, to perform an operation required in order to carry out the additional definition of the signal processing function new to a resource of the item processing device 3 in ********** 10, this resource controller 144 grasps details of a resource of the signal processing device 3.

[0081]Hereafter, the composition descriptive information providing device 140 is formed in a base station, and the mobile radio communication equipment 10 takes a radio communications

system of drawing 17 which is a terminal for an example, How to grasp details of a resource (henceforth a terminal resource) of the signal processing device 3 in the mobile radio communication equipment 10 in a base station is explained.

[0082]As shown in drawing 21, the layer composition (L1/L2: layer 1 / layer 2) in the usual base station has data link control (DLC) and a physical layer (PHY). DLC has media access control (MAC), an error control block (EC), and a radio resource controller (RRC). In a base station, an error control block (EC) receives the data sent from the upper layer, and signal processing is performed in order to have the tolerance over the error generated with a radio-transmission-and-reception device. The signal outputted from the error control block (EC) is sent to media access control (MAC). The signal outputted from MAC is sent to a physical layer (PHY). In PHY, signal processing for abnormal conditions is performed and the RF signal for presenting wireless transmission is generated. EC, MAC, and PHY are controlled by a radio resource controller (RRC). On the contrary, when a base station receives the sending signal from a terminal, processing is performed in the reverse order of the flow of an above-mentioned signal.

[0083]The layer composition in the base station of the radio communications system according to this embodiment is shown in drawing 22. The controller which newly controls a terminal resource in L1 / L2 layer composition shown in drawing 21 is added to drawing 22. Specifically, TRC (Terminal Resource Control) is added as a component of DLC (Data LinkControl). TRC communicates with RRC (Radio Resource Control) uniquely, and acquires the body number or machine kind information of a terminal by it. That is, TRC acquires the body number or machine kind information of a terminal by monitoring communication between a terminal and a base station.

[0084]The method of using a table is mentioned as one of the methods which grasps the resource which the terminal owns from a body number or terminal species information. The example of such a table is shown in drawing 23. The resource list which showed the details of the terminal resource in the table is referred to. in a resource list, the quantity of a functional block name and each functional block is written, and concurrent use is still more nearly improper to it so that it may be illustrated by drawing 24 -- like -- special affairs are indicated. The resource is divided into the redefinition impossible field and the redefinition feasible region as mentioned above.

[0085]TRC grasps the necessary resource quantity for defining a desired signal processing function as a terminal resource using the information on a resource list which was illustrated to drawing 24, asks for the optimal resource allocation by an operation, and outputs resource allocation directions information. Resource allocation directions information is transmitted to a terminal from a base station. The table shown in drawing 23 is updated whenever a new terminal is released.

[0086]Layer composition of a base station (BS) and a terminal (MT) according to this embodiment is shown in drawing 25. TRC is provided in base station BS and a resource controller (RC) is formed in terminal MT, respectively. TRC has a resource list of each terminal. Terminal resources differ for every terminal. RC has a resource management table showing an operating condition of a terminal resource. Rates of a redefinition impossible field of a terminal resource and a redefinition feasible region differ for every terminal. An operating condition of a terminal resource is monitored by a resource monitor system.

[0087]TRC provided in base station BS communicates between RC provided in terminal MT, and acquires information on an operating condition of a terminal resource from a terminal. TRC transmits a message as shown in drawing 26 to RRC, for example, in order to grasp an operating condition of a terminal resource. It is required that RRC of base station BS will notify an operating condition of a terminal resource to a base station to RC provided in terminal MT if this message is received. If this demand is received, RC of terminal MT will update a table of an operating condition of a terminal resource, and will transmit the table concerned to base station BS. TRC of base station BS has a resource list of terminal MT, and grasps a kind and quantity of a resource which terminal MT owns with this list. Therefore, a resource operating condition table sent to base station BS from MT terminal is simplified by table on which only a numerical value was described according to turn defined beforehand, as shown in drawing 27. RRC which received an operating condition table of this resource transmits a message as shown in drawing 28 to TRC with which a base station was equipped.

[0088]By the above procedure, TRC can grasp the operating condition of a terminal resource. Using the information on a body number or a terminal kind, the resource which the terminal owns is grasped and the operating condition of a terminal resource is further acquired from a terminal. TRC asks for the optimal resource allocation that is needed for the newly added function by an operation based on these information further, and outputs resource allocation directions information. This resource allocation directions information is transmitted to a terminal from a base station.

[0089]In the terminal which can change a signal processing function, the amount of the resource used changes one by one. That is, the case where a part of function once set as the terminal becomes unnecessary may happen. Therefore, resource management based on the newest information can be performed by performing renewal of a resource management table, when adding a function.

[0090]What is necessary is just to add the mechanism of transmitting the additional definition of the function having been impossible for from the mobile radio communication equipment 10 to the composition descriptive information providing device 140, in the radio communications system shown, for example in drawing 16, in order to notify a terminal that the addition of the signal processing function was impossible for. the time of carrying out the additional definition

of the signal processing function -- the additional definition of all the signal processing functions -- being alike -- a resource may be insufficient. In such a case, a base station can grasp that the additional definition of a new signal processing function was impossible for at the terminal side. In a base station, grasp of this purport will transmit composition descriptive information so that the additional definition of the signal processing function of the minimum according to surplus resource quantity in the terminal side can be performed. The improvement in service as a radio communications system is attained by such minimum additional definition.

[0091](A 6th embodiment) Mobile radio communication equipment according to a 6th embodiment of this invention is shown in drawing 29. This mobile radio communication equipment has the antenna 1, the radio-transmission-and-reception device 2, the signal processing device 3, the resource controller 4, and the memory storage 5 like an old embodiment. In drawing 29, the system controller 6 and the input-and-output device unit 7 which were shown in drawing 1 are omitted.

[0092]The signal processing device 3 is constituted by programmable hardware device like a processor which performs signal processing by software or PLD like CPU or DSP, for example. If a case where the signal processing device 3 is a processor is taken for an example, this processor will have a storage area like a RAM area where an execution program is read, and signal processing will be performed by reading a module group which constitutes a program for performing signal processing to this storage area. A module here is a file of compiled executable code, and each signal processing function is software-module-ized.

[0093]The program and the data file are stored in the memory storage 5. Especially as a program, the module group the specification in the signal processing device 3 is assumed to be is stored. The module group which is needed when the mobile radio communication equipment concerned changes by this, without another mode, for example, the mode in which another channel is received, can be read from the memory storage 5, and the signal processing device 3 can be passed.

[0094]The example of the storage area of the signal processing device 3 and the contents of the memory storage 5 is shown in drawing 30. The signal processing device 3 has DSP210 as a processor, and the voice transmission module 211 and the voice receiving module 212 are read into the storage area. The data transmission module 221, the equalizer module 222, the Viterbi decoder module 223, and the CRC module 224 are stored in the memory storage 5.

[0095]The resource controller 4 has the source management table 200, the resource manager 201, the resource rewriting processor 202, and the download buffer 203. The information on the preservation place of the module which can be performed with the signal processing device 3 is memorized by the resource management table 200. The resource manager 201 controls an order of replacing the (a) resource, and the timing to (c) judgment whether it

changes or not and (b) Replace. The resource rewriting processor 202 rewrites a module with the directions from the resource manager 201 to the processor of the signal processing device 3 stored in the memory storage 5. The download buffer 203 stores temporarily the module downloaded from the outside.

[0096]Fundamental operation of the mobile radio communication equipment according to this embodiment is the same as that of the embodiment described until now, and the characteristic operation is as follows. The radio transmission line between the base stations which are not illustrated with mobile radio communication equipment by shadowing, i.e., mobile radio communication equipment, going into a place behind something etc. deteriorates, and it carries out to having stopped fulfilling desired communication quality. Communication quality is detected by the electric-field measurement function which the radio-transmission-and-reception device 2 has, for example.

[0097]If desired communication quality is no longer fulfilled, it will be judged that the resource controller 4 newly needs to build an equalizer module into the resource of the signal processing device 3 in order to aim at improvement in communication quality. If the resource of the signal processing device 3 has a margin in the resource controller 4 based on this judgment, the resource manager 201 will perform control which builds an equalizer module into this resource. The resource manager 201 checks whether an equalizer module exists in the memory storage 5 by referring to the resource management table 200.

[0098]If the equalizer module 222 is in the memory storage 5 as shown in drawing 30, the resource controller 4 will read it into the signal processing device 3 as an executable file of the processor which is the signal processing device 3. If there is no equalizer module into the memory storage 5, the resource controller 4 advances a download request, acquires this module, and stores it in the download buffer 203.

[0099]When a required module is not stored in the memory storage 5 with the signal processing device 3 in mobile radio communication equipment, a download request is advanced to a base station in which mobile radio communication equipment has the area which is carrying out the current position as a service area. A base station is transmitted to a network which does not illustrate a received download request. A network transmits a demanded module to mobile radio communication equipment which advanced a download request via a base station.

[0100]Thus, by replacing a program held in a storage area of a processor which is the signal processing device 3, a required signal processing function is defined as the signal processing device 3. It is incorporated only when a required module is required as a program. A waste of a resource by an unnecessary module thereby usually residing in a storage area of a processor permanently, i.e., unnecessary occupancy of a memory resource, can be suppressed. Therefore, it can respond to roaming and a hand-off between different radio communications

systems, aiming at effective use of a resource which has restriction in capacity.

[0101]Next, a more concrete example of mobile radio communication equipment according to this embodiment of operation is explained. First, a case where a communicative classification is changed is described as mobile radio communication equipment is changed from a state which was being used for a voice call to the state of using for data communications like browsing of Web.

[0102]When it is going to change a communicative classification from a voice call to data communications, it becomes unnecessary, a module, for example, a voice CODEC module, for voice calls, and a module which newly mounted TCP/IP instead of it is needed. The resource manager 201 checks whether a TCP/IP module exists in the memory storage 5 with reference to the resource management table 200. It [with / a TCP/IP module] is read in the memory storage 5 in a storage area of a processor as an executable file of a processor which is the signal processing device 3. A module for voice calls like a voice CODEC module which became unnecessary is cleared from a storage area of this processor.

[0103]The resource manager 201 acquires by download which was mentioned above when there was no TCP/IP module in the memory storage 5. After an acquired TCP/IP module is saved at the memory storage 5, it is written in the resource management table 200. the resource manager 201 checks whether it resembles the memory storage 5 again and a TCP/IP module exists with the resource management table 200. If a TCP/IP module exists in the memory storage 5, it will be read into a storage area of a processor as an executable file. Thereby, data communications become possible henceforth.

[0104]Drawing 31 and drawing 32 explain this operation. As shown in drawing 31, the voice transmission module 211 and the voice receiving module 212 are read into the storage area of the signal processing device 3 like drawing 30. The data transmission module 221, the data receiving module 225, the voice transmission module 226, and the voice receiving module 227 are stored in the memory storage 5.

[0105]In the first step S401, DSP210 uses the voice transmission module 211 and the voice receiving module 212, and is performing signal processing for a voice call. It is in this state and suppose that the user of mobile radio communication equipment operated the input-and-output device unit 7 shown in drawing 1, and next directed data-communications shift. The resource controller 4 advances an update-of-resources demand in response to these directions (Step S402). Thereby, the resource manager 201 of the resource controller 4 confirms whether a data-communications module is in the memory storage 5 with reference to the resource management table 200 (Step S403). When there is no data-communications module into the memory storage 5, a download request is advanced, in a certain case, it rewrites to DSP210, and a start is notified (Step S404). This stops execution of a certain module by DSP210 to the storage area now.

[0106]Next, the resource controller 4 deletes a certain voice transmission module and a voice receiving module to the storage area of DSP210 now using the rewriting processor 202, A data transmission module and a data receiving module are read from the memory storage 5, and it is made to write in the storage area of DSP210 (Step S405). If the rewriting processing by the rewriting processor 202 is completed, the resource controller 4 will be rewritten to DSP210 and will perform a terminating notice (Step S406). In response to a rewriting terminating notice, DSP210 performs the data transmission module and data receiving module in the storage area, and performs signal processing for data communications (Step S407).
[0107]Thus, a module in a storage area (memory resource which DSP210 has) of DSP210 is changed to a basis of management of the resource controller 4. Thereby, a signal processing function of DSP210 is changed into a function of data communications from a function of a voice call, and exchange of a signal processing function can be realized, using beneficially a storage area of limited capacity which DSP210 has. Therefore, occupancy of a memory resource by an unnecessary module is suppressed.
[0108]According to the example of drawing 33, it replaces with the signal processing device 3 at DSP, and a programmable hardware device, for example, PLD230, is programmably used for rewriting. PLD230 is operating by the module group 231 (for example, the module A, B, and C, D), and the module group 240 (for example, the module A, B, and C, D, E, F, --) use by PLD231 is assumed to be is stored in the memory storage 5. It is as [a module said here is a module of a circuitry program (circuitry description), for example,] it is shown in a layout wiring figure of PLD.
[0109]If operation is explained using drawing 34, PLD230 is performing signal processing first using the module A, B, and C for building the circuitry which performs signal processing for a voice call, and D (Step S501). Suppose that the input-and-output device unit 7 shown in drawing 1 was operated, and data-communications shift was directed in this state noting that the user wanted to perform data communications. The resource controller 4 advances an update-of-resources demand in response to these directions (Step S502). It is assumed that the module B, C, and D is a module for building the circuitry about required signal processing also in any of a voice call and data communications.
[0110]In data communications, since it is memorized beforehand that the module B, C, and D and E are required, it knows that the resource controller 4 needs to change the module A to the module E by investigating the present configuration of module in PLD230. The resource manager 201 of the resource controller 4 confirms whether there is the module E for building the circuitry which performs signal processing for data communications to the memory storage 5 with reference to the resource management table 200 (Step S503) (Step S504).
[0111]When the module E is in the memory storage 5, the resource manager 201 gives directions which rewrite the module A in the module group 231 currently held PLD230 to the

module E to the rewriting processor 202. In response to these rewriting directions, the rewriting processor 202 performs a modular rewriting start notice to PLD230 (Step S505). Thereby, PLD230 stops processing execution by circuitry by a module held now. Next, the rewriting processor 202 cancels the module A which PLD230 holds, reads the module E from the memory storage 5 instead, and replaces with the module A (Step S506).

[0112]Thus, if it rewrites and module rewriting processing of PLD230 by the processor 202 is completed, the resource controller 4 will be rewritten to PLD230 and will perform a terminating notice (Step S507). In response to this rewriting terminating notice, PLD230 builds circuitry using the module group 231 (the module B, C, and D, E) newly held, and performs signal processing of data communications using that circuitry (Step S508).

[0113]On the other hand, when there is no module E in the memory storage 5 in Step S504, the resource controller 4 advances a download request (Step S509). The module E downloads and it is temporarily held by this demand at the download buffer 203. Then, it rewrites to PLD230 at Step S505, and a start is notified (Step S505). Thereby, at Step S506, the module E held at the download buffer 203 rewrites, and it is read by the processor 202, and is written in PLD230.

[0114]Downloading in this way, after download finishes, the module E promptly downloaded to PLD230 can be written in, and it becomes possible from a voice call to shift to data communications for a short time. A module acquired by download is saved at the memory storage 5 if needed, and it is not only temporarily stored in the download buffer 203, but is appropriated for the future use.

[0115](A 7th embodiment) According to a 6th embodiment, a module is replaced with an unnecessary module in a change of a signal processing function of the signal processing device 3 for realizing a new signal processing function among two or more required modules. When preparing a module group which made a module required according to a use a set, respectively and changing a signal processing function, it may change per module group. It enables this to switch a signal processing function of the signal processing device 3 at high speed.

[0116]The mobile radio communication equipment according to a 7th embodiment that replaces such a module group unit is shown in drawing 35. This mobile radio communication equipment can be adapted for several different radio communications systems. Therefore, the module group 241,242 for performing signal processing for communication with a different radio communications system is stored in the memory storage 5. These module groups 241,242 can be updated by exchanging the memory storage 5. DSP210 of the signal processing device 3 reads the module group 213, and is operating.

[0117]It assumes that mobile radio communication equipment is communicating with the base station with the present radio communications system X now, and in order to perform a

handover in this state, suppose that it needed to communicate with the base station by radio communications system Y. In this case, the resource manager 201 judges that the necessity that mobile radio communication equipment performs communication with radio communications system Y occurred, and controls an order of replacing a resource, judgment whether it changes or not, the timing to replace, etc. The resource manager 202 opens wide the module which is not used by the system X, rewrites directions of incorporating the module for system Y, and takes out to the processor 202. The rewriting processor 202 performs modular rewriting processing from the memory storage 5 to DSP210 in response to these directions.

[0118]Here, since the radio communications system X is under use still now, what is used among module groups for system X currently written in a storage area of DSP210 needs to leave it. Then, a module which is not used is investigated, the module is wide opened from a storage area of DSP210, and a module for system Y is built into a storage area as a surplus resource which this produced. Thereby, mobile radio communication equipment becomes possible [communicating with both radio communications systems X and Y].

[0119]Operation in a case of opening the module X1 wide and reading the module Y1 from a state where signal processing is performed using the module X1 for DSP210 to communicate under the system X, X2, X3, and X4, using drawing 36, in order to communicate under the system Y is explained.

[0120]First, in Step S601, the module X1 for communicating under the system X, X2, X3, and X4 are written in a storage area of DSP210, and DSP210 is performing signal processing using the module X1, X2, X3, and X4. It is in this state, and if a handover arises, for example, the resource controller 4 will generate a module update request (Step S602). The resource manager 201 checks a check of whether in response to this module update request, the memory storage 5 has a module group for communications system Y with reference to the resource management table 200, and composition of a module group for communications system X (Step S603).

[0121]The resource manager 201 judges judgment which [of judgment of a module required for communication by radio communications system Y, and the module groups for radio communications system X] is replaced, and an order of replacing a resource. As this result, the resource manager 201 judges that the module X1 is required for needlessness and the module Y1, and should write in the X1 deletion-back Y1. The resource manager 201 gives directions of the purport that the module X1 in the module group 213 currently held DSP210 is rewritten to the module Y1, to the rewriting processor 202. The rewriting processor 202 performs a modular rewriting start notice to DSP210 in response to these directions (Step S604). Thereby, DSP210 stops the processing execution by the module held now.

[0122]Next, the rewriting processor 202 cancels the module X1 of the module groups 213

currently held DSP210, reads the module Y1 from the memory storage 5 instead, and replaces with the module X1 (Step S605). If this rewriting processing is completed, the resource controller 4 will be rewritten to DSP210 and will perform a terminating notice (Step S606). DSP210 performs signal processing for data communications using the module group 213 (the module X2, X3, X4, Y1) currently held in response to this notice (Step S607).

[0123]By thus, the thing for which the module in DSP210 is changed to the basis of management of the resource controller 4. The module storage area (capacity limited memory resource) of DSP210 is utilized effectively, and it becomes possible to perform communication which was being performed only under the communications system X until now with the communications systems X and Y. Thereby, a handover is easily realizable.

[0124]Another example of operation in this embodiment is explained using drawing 37. It is assumed that mobile radio communication equipment is communicating under radio communications system U. When a handover is performed so that mobile radio communication equipment may communicate under another radio communications system V on the boundary of a cell (namely, service area), A module is selectively replaced so that the resource of DSP210 which is the signal processing device currently used by radio communications system U may be gradually used by radio communications system V. By carrying out like this, the soft hand over between different radio communications systems becomes possible.

[0125]It is made to be gradually occupied from the state where the module read into DSP210 is specifically occupied by the system U by the system V. About the module for system V, if beforehand stored in the memory storage 5, it will be used, and it will be acquired by download if there is nothing.

[0126]The state which is communicating under radio communications system U in drawing 37 (it is Step S701 and suppose that the hand-off arose and the module update request occurred (Step S702).) In Step S701, the module U1, U2, U3, and U4 are written in the storage area as the module group 213, and DSP210 assumes that signal processing is performed using these modules.

[0127]The resource manager 201 refers to the resource management table 200 which memorized the preservation place etc. of the module which can be performed by DSP210, An order of replacing a resource, judgment whether it changes or not, the timing to replace, etc. are judged, it rewrites to rewriting processor 202 and DSP210 based on the judgment, and a start is notified (Step S703- S704). This stops the processing execution by the module group 213 held now by DSP210. The module group 213 already written in DSP210 at this time, As shown in Step S705, it is the module U1 for performing signal processing for the communication under the system U altogether, U2, U3, and U4, and the module for performing signal processing for communication by the system V is not contained.

[0128]Then, the rewriting processor 202 opens a storage area of the module U1 first so that it

may rewrite gradually the module group 213 currently written in DSP210 under control by the resource manager 202. Next, the rewriting processor 202 writes in the module V1 read from the memory storage 5 to a field opened wide (Step S706). Next, the rewriting processor 202 writes in the module V2 which opened a storage area of the module U2 wide, and read it from the memory storage 5 to a field opened wide (Step S707). The module V3 which it next rewrote, and the processor 202 opened a storage area of the module U3 wide like the following, and was read from the memory storage 5 to a field opened wide is written in (Step S708). Next, the rewriting processor 202 writes in the module V4 which opened a storage area of the module U4 wide, and read it from the memory storage 5 to a field opened wide (Step S709).

[0129]Thus, under control by the resource manager 201, a module to a storage area of DSP210 is gradually rewritten by the rewriting processor 202. If required all are rewritten, the resource manager 201 will rewrite to DSP210 and will perform a terminating notice (Step S710). DSP210 which received this notice processes data communications using the module group 213 (the module V1, V2, V3, V4) held now (Step S711).

[0130]Thus, the module group 213 in DSP210 is gradually changed to the basis of management of the resource controller 4 corresponding to the signal processing function of which it is required. It is got blocked by this, utilizing effectively the module storing region (capacity limited memory resource) of DSP210, and the soft hand over between different radio communications systems is made possible, suppressing occupancy of the resource by an unnecessary module.

[0131](An 8th embodiment) As shown in drawing 38, the common hardware resource 232 is prepared for the programmable hardware device 3, for example, the signal processing device which used PLD230, in the mobile radio communication equipment according to a 7th embodiment of this invention. The common hardware device 232 may be hardware different from PLD230, and may be a part of PLD230 [3A], for example, the redefinition impossible field shown in drawing 11.

[0132]Mobile radio communication equipment may need to monitor another radio communications system in the state where it is communicating under a certain radio communications system. In such a case, in this embodiment, a part of module group 231 read into PLD230 is opened wide, and some newly monitored modules for radio communications systems are incorporated. The procedure of this opening and inclusion may be the same as the procedure explained by a 7th embodiment.

[0133]The common hardware device 232 is a device used common to two or more radio communications systems. Therefore, this device 232 is used in common under the radio communications system which mobile radio communication equipment is using for communication, and another radio communications system which it is going to monitor. The

processing burden of the resource of PLD230 is eased by using the common hardware device 232.

[0134]Thus, also in the composition which uses a programmable hardware device like PLD230 for the signal processing device 3, By incorporating or changing the module which is circuitry description for changing the circuitry of PLD230 to the storage area of PLD230 if needed, when monitoring a radio communications system. Occupancy of the resource of PLD230 by an unnecessary module is suppressed, and effective use of a resource can be performed.

[0135](A 9th embodiment) In the mobile radio communication equipment according to a 9th embodiment of this invention shown in drawing 39, the executable file 214 common to two or more radio communications systems is stored in the signal processing device 3. Mobile radio communication equipment considers the case where another radio communications system is monitored in the state where it is communicating under a certain radio communications system that an 8th embodiment described the same way. In such a case, a part of module group 213 read into DSP210 is wide opened like the procedure explained by a 7th embodiment, and some newly monitored modules for radio communications systems are incorporated.

[0136]The fixed common executable file 214 is used common to each radio communications system. Therefore, this executable file 214 is used in common under the radio communications system which mobile radio communication equipment is using for communication, and another radio communications system which it is going to monitor. The processing burden of the resource of DSP210 is eased by using the common executable file 214.

[0137](A 10th embodiment) According to the mobile radio communication equipment according to a 10th embodiment of this invention shown in drawing 40 (a), the resource controller 4, It has the module management table 300, the module manager 301, the module rewriting processor 302, and the download buffer 303. The signal processing device 3 has the program memory 311 in which the program (henceforth a treatment module) which shows the signal-processing procedure of DSP310 and DSP310 was stored in this example. The signal processing device 3 is replaced with DSP, and a programmable hardware device like PLA and FPGA may realize, In that case, the software module which described the circuitry of the programmable hardware device is stored in program memory as a treatment module.

[0138]The state of preservation of the treatment module used with mobile radio communication equipment, the quota state of the treatment module to the resource of the signal processing device 3, and the using history of a treatment module are recorded by resource controller 4 self, and the module management table 300 is updated, and is used. The module management table 300 has the module state-of-preservation table 3001, the module quota status table 3002, and the module using history table 3003 at least, as shown in drawing 40 (b).

[0139]A state of preservation of a treatment module is managed by the module state-of-

preservation table 3001. A quota state to a resource of a treatment module is managed with the module quota status table 3002. Information on a using history of a treatment module including modular quota state information and state-of-preservation information on a resource is managed by the module using history table 3003. The module manager 301 records information on a using history of a treatment module on the module management table 300, and performs preservation of a treatment module, deletion, and updating using this module management table 300.

[0140]The download buffer 303 is a buffer space used since the downloaded treatment module is temporarily saved when a treatment module is downloaded from a wireless circuit. The module rewriting processor 302 notifies assignment of a treatment module from the memory storage 5 to the signal processing device 3, and a rewriting start and an end of a treatment module with the directions from the module manager 301. The signal processing device 3 to which a treatment module was assigned by the module rewriting processor 302 incorporates an assigned treatment module from the memory storage 5, and performs a signal-processing procedure described by the treatment module.

[0141]The display device 321 and the input device 322 are shown as a component of the input-and-output device unit 7 by drawing 40 (a). Mobile radio communication equipment and the connectable external storage 9 are prepared if needed via the interface 8 and this interface 8.

[0142]Next, operation of mobile radio communication equipment according to this embodiment is explained. The signal processing device 3 presupposes that it has DSP310 and the program memory 311 as shown in drawing 40 (a). Now, at a point in which a user of mobile radio communication equipment is located, two sorts of radio communications systems (it is considered as the system A and the system B) provide service, respectively, and presuppose that those radio communications systems suited under an available situation with mobile radio communication equipment.

[0143]Suppose that the user performed specification using desired radio communications system, for example, A system, by the key operation of the input device 321 in mobile radio communication equipment. A system use specification information generated by this operation is incorporated into the resource controller 4. The resource controller 4 recognizes the state of preservation of the treatment module needed under specified A system, and the quota state to the resource of the signal processing device 3 with reference to the module management table 300. As a result, if required treatment modules are insufficient, the download request of that treatment module that runs short will be generated.

[0144]This download request generated by the resource controller 4 is transmitted to a base station from the radio-transmission-and-reception device 2 via the channel for control currently prepared, for example as a channel common to each radio communications system. In a base

station, the server or base station in a base station reads the treatment module shown by the received download request from the server provided on the network to which it is connected, and it transmits to the mobile radio communication equipment of a requiring agency.

[0145]It is received by the radio-transmission-and-reception device 2, and the treatment module transmitted to mobile radio communication equipment from the base station is passed to the resource controller 4. In this way, it was received, that is, once the downloaded treatment module is held by the resource controller 4 at the download buffer 303, it is transmitted and saved at the memory storage 5.

[0146]Next, in the resource controller 4, a treatment module quota demand is advanced from the module manager 301 to the module rewriting processor 302. The module rewriting processor 302 reads a required treatment module from the memory storage 5 according to this treatment module quota demand, and performs control written in the program memory 311 of the signal processing device 3. In the signal processing device 3, that DSP310 performs the treatment module written in the program memory 311 realizes signal processing which becomes settled with the treatment module. Therefore, the user of the mobile radio communication equipment concerned can use the new function by the treatment module written in the program memory 311.

[0147]In performing control which reads a required treatment module from the memory storage 5, and is written in the program memory 311, the module manager 301 utilizes the limited memory space of the program memory 311 effectively as follows. With reference to the contents of the module using history table 3003 currently recorded on the module management table 300, an exchange order of a treatment module over the program memory 311, judgment whether it changes or not, exchange timing, etc. are controlled.

[0148]The module manager 301 performs control for performing deletion of the unnecessary treatment module of various kinds of treatment modules currently held further at the memory storage 5, upgrade of the treatment module currently held, etc. When treatment modules required for processing next to the signal processing device 3 are insufficient in the program memory 311 as a result of this control, the module manager 301 generates a treatment module quota demand.

[0149]A treatment module quota demand is given to the module rewriting processor 302, and a required treatment module is written in the program memory 311 by this processor 302. In the signal processing device 3, the treatment module written in the program memory 311 in this way is performed DSP310. The function realized with the treatment module written in program memory 311 by this is realized by mobile radio communication equipment. That is, the new function by the treatment module newly written in the program memory 311 is added to the mobile radio communication equipment concerned.

[0150]Two or more treatment modules can be written in the program memory 311 of the signal

processing device 3. At the signal processing device 3, arbitrary treatment modules are performed by DSP310 in the state where two or more treatment modules were made to coexist in the program memory 311. Each of capacity of the program memory 311 and capacity of the memory storage 5 is limited. Since an order of replacing the treatment module in the signal processing device 3, judgment whether it changes or not, and the timing to replace are controlled by the module manager 301, the situation which runs short of the capacity of the program memory 311 can be controlled.

[0151]If the treatment module is saved at the memory storage 5 whenever mobile radio communication equipment downloads a new treatment module, the empty storage area of the memory storage 5 may be insufficient soon. If an empty storage area is lost to the memory storage 5, it is necessary to delete other treatment modules saved at the memory storage 5, to be vacant, and to secure a storage area. In that case, it is desirable to be deleted from the treatment module which is not required for mobile radio communication equipment, i.e., a treatment module with low probability used for next time with mobile radio communication equipment. For this reason, the frequency in use of the treatment module used in the past is always supervised by the module manager 301, and a monitored result is recorded on the module using history table 3003 of the module management table 300. A treatment module with least frequency in use is deleted on the module using history table 3003 by the module manager 301. Thereby, the empty storage area of the memory storage 5 is secured, and is saved in the downloaded new treatment module at the memory storage 5.

[0152]The list of the items described by the module using history table 3003 in the module management table 300 is shown in drawing 41 (a). The items of a module using history are a module name, module size, frequency in use, a state of preservation and a quota state, and ******. A module name is a name of a treatment module. Module size is the capacity of the memory storage 5 required to save a treatment module. Frequency in use is the number of times which uses a treatment module with mobile radio communication equipment. The state of preservation is information which shows the state where the treatment module is saved in the storage area, if this treatment module is saved, it is specifically an address of the program memory 311, and if it is not saved, it is NO. It is the information which shows whether the treatment module is assigned to the program memory 311, and if the quota state is assigned, it turns on, and if not assigned, it will be set to OFF.

[0153]Although the treatment module of OFF of a resource quota state is saved at the memory storage 5, it is not assigned to the program memory 311. The treatment module which should be deleted is chosen from the treatment module of OFF of a resource quota state. When all the treatment modules are assigned to the program memory 311, the treatment module which should be deleted is deleted after assignment to the program memory 311 is opened wide.

[0154]The concrete example of contents of the module using history table 3003 is shown in

drawing 41 (b). In this example, there are QPSK modulation, correlator, convolutional-code-izing, PN-code-izing, and Walsh coding as a module name. Module sizes are 10200Byte, 15300Byte, 12900Byte, 25000Byte, and 18000Byte, respectively, Frequency in use is 320 times, 230 times, 202 times, 23 times, and 98 times, respectively, Preservation places are the 0x100th NO(s) [0x400th / 0x5000th / 0x3000th] (however, 0x shows the hexadecimal notation), respectively, and it is shown that quota states are ON, ON, OFF, OFF, and OFF, respectively.

[0155]With reference to drawing 42, the procedure which deletes the unnecessary treatment module in the memory storage 5 is explained using the use frequency information recorded on the module using history table 3003 shown in drawing 41 (b). This procedure is performed by the module manager 301. Refer to the frequency in use for a start of modular deletion among the items currently recorded on the module using history table 3003 (Step S702). (Step S701) It assigns by this reference, and in the treatment module of OFF, a state looks for a treatment module with least frequency in use, and gives the directions which delete that treatment module from the memory storage 5 to the resource controller 4. The resource controller 4 deletes the treatment module in which deletion was directed from the inside of the memory storage 5 (Step S703). The module manager 301 deletes the hysteresis information of the deleted treatment module from the module using history table 3003 (Step S704). Operation of Steps S702-S704 is repeated until it is judged that the availability required of Step S705 was secured.

[0156]For example, when the example of contents of the module using history table 300 shown in drawing 41 (b) is followed, there is least frequency in use of the Walsch coding among convolutional-code-izing which is a treatment module of OFF of a quota state, PN-code-izing, and the Walsch coding. Therefore, the treatment module of this Walsch coding is deleted. The hysteresis information of the treatment module of the Walsch mark is deleted from the module using history table 3003. In this way, reservation of capacity required for the memory storage 5 will terminate deletion of a treatment module (Step S706). As a result, the contents of the module using history table 3003 shown in drawing 41 (b) are updated as shown in drawing 41 (c).

[0157]In such a procedure, a frequently-used treatment module, i.e., a treatment module with a high possibility of being used for the next, is saved by deleting a treatment module by the module manager 301 at the memory storage 5. Therefore, since download processing is no longer recklessly performed about a treatment module with a high possibility of being used, the processing load of mobile radio communication equipment is reduced.

[0158]Next, the case where the module using history table shown in drawing 43 (a) - 43 (c) is used is explained. As the list of the items described by the module using history table 3003 is shown in drawing 43 (a), the item of a module using history is the same as that of drawing 41

(a) except frequency in use being transposed to the newest use time, and being. The newest use time is the newest time stamp that specifically wrote the treatment module read from the memory storage 5 in the program memory 311. As shown in drawing 43 (b), the example of contents of the module using history table 3003, Except that 2005/04/14-2005/12/21-2003/05/04, 2005/02/03, and 2005/08/14, are filled in as a use updated date, it is the same as that of drawing 41 (a).

[0159]With reference to drawing 44, procedure which deletes an unnecessary treatment module in the memory storage 5 is explained using information on the newest use time recorded on the module using history table 3003 shown in drawing 43 (b). This procedure is performed by the module manager 301. Refer to the newest use time for a start of modular deletion among items currently recorded on the module using history table 3003 (Step S802). (Step S801) It assigns by this reference, and in a treatment module of "OFF", a state looks for a treatment module with the oldest newest use time, and gives directions which delete that treatment module from the memory storage 5 to the resource controller 4. The resource controller 4 deletes a treatment module in which deletion was directed from the inside of the memory storage 5 (Step S803). The module manager 301 deletes hysteresis information of a deleted treatment module from the module using history table 3003 (Step S804). Operation of Steps S802-S804 is repeated until it is judged that an availability required of Step S805 in the memory storage 5 was secured.

[0160]For example, when the example of contents of the module using history table 300 shown in drawing 43 (b) is followed, the newest use time of convolutional-code-izing is the oldest among convolutional-code-izing which is a treatment module of OFF of a quota state, PN-code-izing, and the Walsch coding. Therefore, the treatment module of this convolutional-code-izing is deleted from the inside of the memory storage 5, and the hysteresis information of the treatment module of convolutional-code-izing is deleted from the module using history table 3003. In this way, reservation of capacity required for the memory storage 5 will terminate deletion of a treatment module (Step S806). As a result, the contents of the module using history table 3003 shown in drawing 43 (b) are updated as shown in drawing 43 (c).

[0161]In such a procedure, a treatment module with the new newest use time, i.e., a treatment module with a high possibility of being used for the next, is saved by deleting a treatment module by the module manager 301 at the memory storage 5. Therefore, since download processing is no longer recklessly performed about a treatment module with a high possibility of being used, a processing load of mobile radio communication equipment is reduced. When mobile radio communication equipment is used by user who changes his use actual condition frequently, an addition and deletion of a useless treatment module which is not adapted to the use actual condition are attained.

[0162]Next, a case where a module using history table shown in drawing 45 (a) - 45 (c) is used

is explained. As a list of items described by the module using history table 3003 is shown in drawing 45 (a), an item of a module using history is the same as that of drawing 41 (a) and drawing 43 (a), except that frequency in use or the newest use time is deleted.

[0163]With reference to drawing 46, the procedure which deletes the unnecessary treatment module in the memory storage 5 is explained using the information on the module size recorded on the module using history table 3003 shown in drawing 44 (b). This procedure is performed by the module manager 301. Refer to the module size for a start of modular deletion among the items currently recorded on the module using history table 3003 (Step S902). (Step S901) It assigns by this reference, and in the treatment module of "OFF", a state looks for a treatment module with the largest module size, and gives the directions which delete that treatment module from the memory storage 5 to the resource controller 4.

[0164]The resource controller 4 deletes the treatment module in which deletion was directed from the inside of the memory storage 5 (Step S903). The module manager 301 deletes the hysteresis information of the deleted treatment module from the module using history table 3003 (Step S904). Operation of Steps S902-S904 is repeated until it is judged that the availability required of Step S905 was secured.

[0165]For example, when the example of contents of the module using history table 300 shown in drawing 45 (b) is followed, the module size of the Walsh coding is the largest among convolutional-code-izing which is a treatment module of OFF of a quota state, PN-code-izing, and the Walsch coding. Therefore, the treatment module of this Walsh coding is deleted from the inside of the memory storage 5, and the hysteresis information of the treatment module of the Walsh coding is deleted from the module using history table 3003. In this way, reservation of capacity required for the memory storage 5 will terminate deletion of a treatment module (Step S906). As a result, the contents of the module using history table 3003 shown in drawing 45 (b) are updated as shown in drawing 45 (c).

[0166]In such a procedure, by deleting a treatment module by the module manager 301, a quota state is OFF and a treatment module with large module size is deleted sequentially from the memory storage 5. Therefore, a required empty storage area is secured on the memory storage 5. By deleting a treatment module with the biggest size, a possibility that a field more than size of a required storage area will be secured by one deleting operation becomes high on the memory storage 5. Thereby, deleting operation of a treatment module can be managed with the minimum number of times, and a processing load required for deletion is reduced.

[0167]Next, an example considered as composition which added a function to investigate and save version information of a treatment module which mobile radio communication equipment uses on the module using history table 3003 is explained.

[0168]As a list of items described by the module using history table 3003 is shown in drawing 47 (a), it is the same as that of drawing 41 (a) and drawing 43 (a) except replacing with

frequency in use or the newest use time, and having a version in an item of a module using history. A version is the revision information of a treatment module. For example, as shown in drawing 47 (b), a version of QPSK modulation, correlator, convolutional-code-izing, PN-code-izing, and the Walsh coding presupposes that it is 2.1, 1.3, 3.1, and 2.3 and 1.8.

[0169]With reference to drawing 48, procedure which updates a module in the memory storage 5 to a higher version is explained using information on a version shown in drawing 47 (b). If a modular update process begins and a modular update request, i.e., a utilization request of a new treatment module, is inputted into the module manager 301 (Steps S1001-S1002). The module manager 301 investigates whether a required treatment module exists in the memory storage 5 with reference to the contents of the module using history table 3003 in the module management table 300 (Step S1003) (Step S1004).

[0170]If a required treatment module does not exist in the memory storage 5, a treatment module of a required version is downloaded from a wireless circuit (Step S1005), and it is saved at the memory storage 5 (Step 1006). since a treatment module of a new version is newly saved by this at the memory storage 5, the module rewriting processor 302 includes the new treatment module in the memory storage 5 next -- ** -- a required treatment module is written in the program memory 311 (Step S1010).

[0171]On the other hand, if a required treatment module exists in the memory storage 5 as a result of the check in Step S1004, The module manager 301 compares the version of the treatment module of the memory storage 5 with the version of an actually required treatment module with reference to the module using history table 3003 (Step S1007). If the version of the treatment module of the memory storage 5 is equal to the version of a required treatment module as a result of this comparison, a required treatment module will be loaded from the memory storage 5, and it will write in the program memory 311 (Step S1010).

[0172]If the version of the treatment module in Step S1007 saved at the memory storage 5 as a result of the check is old, The treatment module of a version more nearly required than a wireless circuit is downloaded (Step S1008), and it changes for the treatment module of the old version which exists in the memory storage 5 (Step S1009). Since the treatment module in the memory storage 5 is updated now by the new version, the module rewriting processor 301 writes the required treatment module in the memory storage 5 in the program memory 311 next (Step S1010). If processing of Step S1010 is performed, the version update process of a treatment module will be ended (Step S1011).

[0173]Here, it considers using the convolutional code-ized treatment module which is not assigned to the program memory 311 according to the example of contents of the module using history table 3003 shown, for example in drawing 47 (b). The version of the convolutional code-ized treatment module needed presupposes that it is 4.0. The module manager 301 gets to know that the convolutional code-ized treatment module is saved at the memory storage 5

with reference to the module using history table 3003. The version of the convolutional code-ized treatment module saved at the memory storage 10 is 3.1, and the module using history table 3003 shows that it is older than the version 4.0 needed.

[0174]Then, the module manager 301 requires that the convolutional code-ized treatment module of the version 4.0 should be downloaded to the radio-transmission-and-reception device 2. The convolutional code-ized treatment module of the version 4.0 which this downloaded via the radio-transmission-and-reception device 2 is replaced with the old original treatment module, and is saved at the recording equipment 5. Simultaneously, the module using history table 3003 is updated. Then, a new treatment module is assigned to the program memory 311. Thus, the version of a treatment module required whenever it uses a treatment module, and the treatment module saved for the memory measure 5 is compared, and a version will be updated if the version of the treatment module in the memory storage 5 is old.

[0175]Next, the user using mobile radio communication equipment itself explains an example which chooses a treatment module which should be deleted and secures an availability of the memory storage 5. In order to make it possible to choose a treatment module which a user should delete in person, or to input instructions which delete a this chosen treatment module, the display device 321 and the input device 322 with which the input-and-output device unit 7 was equipped are used. As the input device 322, a keyboard, a cursor key and a keystroke device like a cross key, a touch panel installed in a display surface of the display device 321, or a pointing device is used. When it is set as a mode in which a user secures an empty storage area in the memory storage 5, a module name of a treatment module held now, and module size and a state of the present assignment are displayed on the display device 321. The user can choose and specify a treatment module for deletion, being able to see this display. For this reason, the module manager 301, A function to manage the module using history table 3003 in the module management table 300, With reference to the contents of this table 3003, it has at least the function to extract a module name of each treatment module held now at the memory storage 5, and information on module size and state ** of the present assignment. The resource controller 4 has a function to which these information that the module manager 301 extracted is displayed on the display device 321, and the function to delete a treatment module which was specified when a user operated the input device 322 according to this display and which should be deleted from the memory storage 5.

[0176]The function in which the module manager 301 supervises the existence of insufficient generating of the treatment module in the (a) program memory 311, (b) When treatment modules run short, refer to the module using history table 3003, It has a function which controls deletion of the treatment module in an order which the treatment module in the program memory 311 replaces, judgment whether it changes or not and the function which controls the timing to replace, and the (c) memory storage 5, and upgrade. If a treatment

module quota demand is given from the module manager 301 to the module rewriting processor 302, this processor 302 will write the treatment module obtained by download by a wireless circuit, or loading from the memory storage 5 in the program memory 311. In this way, when the signal-processing procedure (treatment module) written in the program memory 311 is performed by DSP310, the function realized with the written-in treatment module is realized by mobile radio communication equipment.

[0177]The information on the file capacity of a correspondence treatment module is attached to the module name in the module using history table 3003. When the module manager 301 assigns a treatment module to the program memory 311 using the information on this file capacity or a treatment module is replaced, It has the function to rewrite the information on a quota state of the applicable treatment module of the module using history table 3003, and to grasp the actual condition. When the mode in which the module manager 301 manages the availability of the memory storage 5 according to this function is set up, the information which should be displayed on the display device 321 is acquired with reference to the module using history table 3003. The resource controller 4 displays on the display device 321 this information that the module manager 301 acquired in a predetermined format.

[0178]An alter operation result by a user from the input device 322 is recognized by the resource controller 4 which is CPU. Based on this recognition result, deletion from the memory storage 5 of shift to a mode selected by the resource controller 4, selected designation of a module name, and a treatment module of a selected module name is performed.

[0179]The user can replace a treatment module by inputting directions which choose a desired radio communications system via the input device 322. If use of a radio communications system with a user, for example, A system, is specified via the input device 322, this specification information will be incorporated into the resource controller 4. The module manager 301 gets to know information on a treatment module which refers to the module management table 300 including the contents of the module using history table 3003, and needs it in specified A system from the module management table 300.

[0180]The module manager 301 from information on the module management table 300. A state of preservation of a treatment module used now and a quota state to a resource (program memory 311) of the signal processing device 3 are got to know, and if it is recognized as treatment modules being insufficient, a download request about the treatment module which runs short will be generated. This download request is sent to a base station via the radio-transmission-and-reception device 2 from the resource controller 4. In a base station, a treatment module shown by a received download request is read from a server, and it transmits to mobile radio communication equipment of a requiring agency.

[0181]It is received by the radio-transmission-and-reception device 2, and the treatment module transmitted to mobile radio communication equipment from the base station is passed

to the resource controller 4. In this way, it was received, that is, the downloaded treatment module is once held by the resource controller 4 at the download buffer 303. At this time, the availability of the memory storage 5 is checked by the resource controller 4.If there is sufficient availability to save the treatment module held at the download buffer 303 as a result of this check, from the download buffer 303, a treatment module is read and it is saved at the memory storage 5. In connection with this, the contents of the module using history table 3003 are updated by the module manager 301.

[0182]When there is not sufficient availability for the memory storage 5 as a result of the above-mentioned check, After a storage area is secured by deleting other treatment modules saved by the module manager 301 at the memory storage 5, the treatment module read from the download buffer 303 is held at the memory storage 5. That is, when the availabilities of the memory storage 5 run short, or when a demand to secure an availability occurs, the module manager 301 extracts the information on all the treatment modules which the memory storage 5 holds with reference to the contents of the module using history table 3003. The display device 321 is controlled by the module manager 301 based on this information, and the list display of the module name of a treatment module, module size, and the state (the present utilizing state) is carried out. The user can know now whether it is a module name of the treatment module currently held at the memory storage 5, capacity, and that each treatment module is used, respectively from this display. A state is not using a user from this display, i.e., he looks for the treatment module in which the quota state serves as OFF. If a quota state finds the treatment module used as OFF, a user will choose the module of the request of them using the input device 322, and will direct deletion of the selected treatment module further. According to these directions, the applicable treatment module in the memory storage 5 is deleted by the resource controller 4. The information about the deleted treatment module is deleted from the module using history table 3003 by the module manager 301.

[0183]The flow of the above processing is explained using drawing 49. When a user specifies the mode of deletion of an unnecessary treatment module by operation of the input device 322, processing of drawing 49 is performed by the module manager 301. When modular deletion begins (Step S1101), the module manager 301, Required information is extracted and it is made to display on the display device 321 from the inside of the information currently recorded on this table 3003 with reference to the module using history table 3003 (Step S1102) (Step S1103). If a user chooses a treatment module to delete from this display information by operation of the input device 322 and specifies it (Step S1104), the module manager 301 will delete that treatment module by which selected designation was carried out from the memory storage 5 (Step S1105).

[0184]The list of items and the concrete example of contents of this table 3003 which were described by the same module using history table 3003 as the example quoted until now are

shown in drawing 50 (a) and drawing 50 (b). The example of the display screen of the hysteresis information in the display device 321 in Step S1103 is shown in drawing 50 (c). In this example of a display screen, the module name of the treatment module saved at the memory storage 5 now, the size of this module, and the present state are displayed. It means whether an applicable treatment module is using a state with mobile radio communication equipment, and - will be displayed if it is not [be / it] under use.

[0185]Specification of the treatment module for deletion is performed in inputting the number which shows the module name for deletion in the bottom on the display screen of drawing 50 (c) with the input device 322. Then, if definite reference operation is carried out, that specified treatment module will be deleted from the inside of the memory storage 5 by the module rewriting processor 302 controlled by the module manager 4. It is desirable for a quota state to specify one of the treatment modules of OFF as a treatment module for deletion. What is necessary is to choose one module which the quota state chose from among the treatment modules of ON suitably, and just to delete, after opening the treatment module wide when there is no treatment module of OFF of a quota state.

[0186]Thus, if the specified treatment module is deleted, the contents of the module using history table 3003 will be updated by the module manager 301 (Step S1106). Step S1102 - operation of 1106 are repeated until it is judged that the availability required of Step S1107 in the memory storage 5 was secured. If a required availability is secured, deletion of a treatment module will be ended (Step S1108). Thus, the information about the treatment module saved in the memory storage 5 is displayed with the display device 321, and the signal processing function of the signal processing device 3 can be chosen because the user of mobile radio communication equipment itself chooses the treatment module for deletion with reference to this. Therefore, mobile radio communication equipment is customizable to the function which suited the user's usage pattern.

[0187]In the above-mentioned explanation, a required treatment module is supplied from the network side via download from a wireless circuit, i.e., a base station, with mobile radio communication equipment. It is also possible to, make the mass external storage 9 mobile radio communication equipment connectable via the interface 8 on the other hand, as shown in drawing 40 (a), and to incorporate a required treatment module into the memory storage 5 in mobile radio communication equipment from this external storage 9. By this, when it needs a treatment module running short and a treatment module of a new version, mobile radio communication equipment, Download from other than a wireless circuit can be performed, and also backup of an important treatment module is realizable by making a treatment module saved at the memory storage 5 in mobile radio communication equipment transmit and hold to the external storage 9. As the external storage 9, a semiconductor memory card, a hard disk drive, MO (Magnetic-Optical disk drive), a CD-ROM drive, CD-R / RW drive, a DVD drive, etc.

are used, for example.

[0188]In the above-mentioned explanation, deletion of a treatment module in the memory storage 5 is performed on the basis of one of two or more items (for example, frequency in use, the newest use time, and module size) recorded on the module using history table 3003. It may enable it to choose arbitrary items used as a standard which deletes a treatment module out of two or more recorded items on the other hand for user itself of mobile radio communication equipment. Management of a treatment module which this set by various usage patterns is attained by the user itself.

[0189](An 11th embodiment) Mobile radio communication equipment according to an 11th embodiment of this invention is shown in drawing 51. In each following embodiment, since it is easy, two radio communications systems (A system and B system) provide service, for example, and mobile radio communication equipment shifts to arbitrary systems of A system and the B systems, and presupposes that it is available. A system and B system are radio communications systems which a communication enterprise A company and B company provide, respectively. Mobile radio communication equipment shown in drawing 51 makes one telephone directory usable as a telephone directory file which has the form only for application software peculiar to each system by A system and B system.

[0190]The signal processing device 2 has the executable file storage 311 which stores an executable file for a strange recovery (treatment module) in which immediate execution is possible by DSP310 and this DSP310. The resource controller 4 has CPU401 and RAM402 which record the present management state of a resource of the signal processing device 2. A keyboard for a display which performs presenting of a variety of information to a user, etc., and a user to do an operational input, and an input device like a cursor key are included in the input-and-output device unit 7.

[0191]In the memory storage 5. The executable file 501 for call management system A and the peculiar telephone number file 503, the executable file 502 for call management system B and the peculiar telephone number file 504, the common telephone number file 510, the translator A511, and the translator B512 are stored.

[0192]The executable file 501 for call management system A is application software used only by A system, and the peculiar telephone number file 503 is a telephone directory file for these application software. Similarly, the executable file 502 for call management system B is application software only in B system, and the peculiar telephone number file 504 is a telephone directory file for these application software.

[0193]The peculiar telephone number file 503 for call management system A is described by the file format which can be used only by call management system A. Similarly, the peculiar telephone number file 504 for call management system B is described by the file format which can be used only by call management system B. Therefore, these peculiar telephone number

files 503 and 504 cannot be diverted to a call management system different, respectively.
[0194]The common telephone number file 510 is a different telephone directory file (telephone number list file) which is described as for the common file format, for example, text file form, in the peculiar telephone number files 503 and 504 for object [for system A], and system B. This file 510 is a file which does not enable use of the above-mentioned application software in mobile radio communication equipment even if used as it is.
[0195]The executable files 501 and 502 for object [for call management system A] and call management system B are the application software for the management about a telephone call, and have the following functions. The executable files 501 and 502 carry out the list display of the telephone number list registered into this file 503 respectively with reference to the peculiar telephone number files 503 and 504 the object for call management system A which is a telephone directory, and for call management system A, or indicate by search. If selected designation of the desired telephone number is carried out by user's operation out of the telephone number displayed further, the dial call of the executable files 501 and 502 will be carried out to the telephone number. The executable files 501 and 502 can also perform addition to the telephone directory of a telephone number in which a user newly wishes to add, and deletion of an unnecessary telephone number. When such application software has shift of a radio communications system, and when there is change to the peculiar telephone number files 503 and 504, a file is changed using a translator and the function controlled that the contents should be updated is given.
[0196]The translator A511 and the translator B512 are software which carries out the conversion process of the file format. This translator A511 and the translator B512, It is used in order to carry out an interconversion of a file between the common telephone number file 510 which is a common list file, and a list file peculiar to application used with a radio communications system which an executable file for a strange recovery specifies.
[0197]Namely, the translator A511 changes a list file peculiar to application software for A systems into the common telephone number file 510 which is a common list file, It has the function to change the common list file concerned into a list file peculiar to application software for A systems. Similarly the translator B512 changes a list file peculiar to application software for B systems into the common telephone number file 510 which is a common list file, It has the function to change the common list file concerned into a list file peculiar to application software for B systems.
[0198]An example of this embodiment of operation is explained. First, mobile radio communication equipment assumes that it is operating as a terminal accommodated in A system. In this state, an executable file for a strange recovery (treatment module) performed by DSP410 supports A system, and this file is stored in the executable file storage 411. At this time, it is recorded on RAM402 by CPU401 that DSP410 is performing an executable file for a

strange recovery corresponding to A system (treatment module). At this time, call management system A only for A system is used through the input-and-output device unit 7 by user. Therefore, the executable file 501 for call management system A stored in the memory storage 5 is read in the resource controller 4, and is performed by CPU401.

[0199]Suppose that the demand a user indicates on a display the menu list "telephone directory A" (namely, telephone number list based on the peculiar telephone number file 503 for call management system A) which is the telephone number list of the partner point to which self telephones frequently to be through the input-and-output device unit 7 was advanced. At this time, the contents of the peculiar telephone number file 503 for call management system A read from the memory storage 5 in the resource controller 4 are read by CPU401 in the resource controller 4, and it is displayed on the display device in the input-and-output device unit 7.

[0200]If he has telephone number information to newly add to a menu list when the telephone call has been got after a user telephones with reference to the display of the telephone number file on this display device or, he can add. The new telephone number information added is added to the peculiar telephone number file 503 for call management system A first read in the resource controller 4. Next, when a user ends use of call management system A, the rewritten peculiar **** number files 503 for call management system A are stored in the memory storage 5 by CPU401 which is performing the executable file 501 for call management system A.

[0201]According to this embodiment, telephone number information of the rewritten peculiar telephone number file 503 for call management system A is transformed into form of the common telephone number file 510 by the translator A511 stored in memory storage, and is managed. Even when an executable file for a strange recovery currently performed by DSP410 by this is changed into a file format corresponding to B system from a file format corresponding to A system and another call management system is used, it makes it possible to use telephone number information.

[0202][when a user specifically ended use of call management system A (the executable file 501 for call management system A application software)],Or when an executable file for a strange recovery currently performed by DSP410 is changed into a file format corresponding to B system from a file format corresponding to A system and RAM402 is rewritten, CPU401 performs the translator A511. Thereby, the peculiar telephone number file 503 for call management system A is transformed into a common file format by the translator A511, and the common telephone number file 510 is overwritten by file after this conversion.

[0203]Hereafter, drawing 52 explains the flow of this processing. As an initial state, the user who possessed mobile radio communication equipment is located in the service area of A system, and mobile radio communication equipment assumes that it is functioning as a terminal which suited A system. Then, if a user moves and the distance of A system and a

base station separates, the receiving field intensity of mobile radio communication equipment will become small, and it will become difficult for mobile radio communication equipment to function as a terminal of A system. At this time, a user is in the service area of B system, and mobile radio communication equipment presupposes that it is in the state where sufficient receiving field intensity is securable to the base station of B system.

[0204]Mobile radio communication equipment has the structure which can perform the change of the radio communications system to be used by supervising whether the reservation of which radio communications system and communications channel is possible using the radio channel for pilots of A system and B system which carries out how [base station] and is connected. Therefore, it can know that mobile radio communication equipment changed into the state where it becomes impossible to maintain a circuit with A system, and a circuit with B system can be secured instead. At this time, by the resource controller 4, the executable file for a strange recovery performed by DSP410 is changed into the file corresponding to B system stored in the executable file storage 411, and this change is recorded on RAM402 (Step S2001).

[0205]It is confirmed whether, by this point in time, the common telephone number file 510 is overwritten by the translator A511 according to the peculiar telephone number file 503 for call management system A updated at the end (Step S2002). If not overwritten, the translator A512 will be performed by the resource controller 4. Thereby, the peculiar telephone number file 503 for call management system A is transformed into common file form, and the common telephone number file 510 is overwritten by the file after conversion (Step S2003). Then, processing progresses to Step S2004. As a result of the check in Step S2002, if overwritten, processing will progress to Step S2004. Although Step S2004 is not necessarily required processing, at this step S2004, the "telephone directory B" of call management system B is started by the user.

[0206]The translator B512 is started in the following step S2005, The file format of the common telephone number file 510 is transformed into the file format of the peculiar telephone number file 504 for call management system B by this translator B512, and the peculiar telephone number file 504 for call management system B is generated or overwritten by this.

[0207]As mentioned above, the peculiar telephone number files 503 and 504 for object [for call management system A] and call management system B are described by file format which can be used only with the call management systems A and B corresponding, respectively. When change by the contents of the file 503 or 504 is, a file after change is changed into common file form, and is once saved as the common telephone number file 510. When a radio communications system which mobile radio communication equipment uses is changed, file conversion of the common telephone number file 510 is carried out, and it enables it to use it under a radio communications system after change. That is, in a stage before a radio

communications system which mobile radio communication equipment uses is changed, even if the file 503 or 504 is modified, a file in which change was reflected under another radio communications system which mobile radio communication equipment uses next can be used.

[0208]Therefore, the peculiar telephone number file 503 for call management system A as for which a user added change in A system, The "telephone directory B" which could reflect in the peculiar telephone number file 504 for call management system B after shifting to B system, and was reflected becomes available (Step S2006). Namely, when a menu list "telephone directory B" which is the telephone number list in call management system B used only by B system used frequently is displayed, The contents of the menu list "telephone directory A" updated by call management system A used by A system can be used as it is. The necessity that a user makes individual management of data different radio communications systems by this is lost, and even if it shifts to which radio communications system, the newest self telephone directory can be used.
[0209]Although the peculiar telephone number files 503 and 504 for object [for call management system A] and call management system B presupposed that it exists on the memory storage 5 in above-mentioned explanation, These files 503 and 504 may be temporary files generated on the memory in the resource controller 4 if needed.
[0210](A 12th embodiment) In the mobile radio communication equipment according to a 12th embodiment of this invention shown in drawing 53. They are the object for web browser A and the executable files 601 and 602 for web browser B, an object for web browser A and peculiar URL files 603 and 604 for web browser B, and common URL (Uniform Resource.) to the memory storage 5. The Locators file 610, the translator A611, and the translator B612 are stored. The software for web (Web) browsing with the executable files 601 and 602 peculiar to A system used only by A system and B system, respectively, and B system, That is, it is the application software for displaying the contents of the data file of a WWW page. The function is materialized by the executable files 601 and 602 being read into the resource controller 4, and performing by this controller 4. Peculiar URL files 603 and 604 are favorite (favorite) URL information list files which are used, respectively with the object for web browser A, and the executable files 601 and 602 for B and which were described in inherent file form. On the other hand, common URL file 410 is described in a predetermined common file form.
[0211]The translator A411 and the translator B412, It is the application software for changing a file format mutually between common URL file 410 and a list file peculiar to browsing software used with a radio communications system which an executable file for a strange recovery specifies. The translator A411 changes into a common list file peculiar URL file 603 for web browser A which is a list file peculiar to browsing application software for A systems, It has the function to change this common list file into peculiar URL file 603 for web browser A. Similarly

the translator B412 changes into a common list file peculiar URL file 604 for web browser B which is a list file peculiar to browsing application software for B systems, It has the function to change this common list file into peculiar URL file 604 for web browser B. These peculiar URL files 603 and 604 are read into the resource controller 4 by each, and the function is realized by performing by this controller 4.

[0212]As mentioned above, peculiar URL file 603 for web browser A is described by file format which can be used by the web browser A, and peculiar URL file 604 for web browser B is described by file format which can be used by the web browser B. Therefore, in the web browser A, if a URL file described by a file format of this exclusive use is not used, specification of a Web page address cannot be performed. Similarly, in the web browser B, if a URL file described by a file format of this exclusive use is not used, specification of a Web page address cannot be performed.

[0213]According to this embodiment, a URL file is saved in the form of a common list file, and when a radio communications system used by mobile radio communication equipment is changed, form of this common list file is changed into the radio communications systems of change time by translator. URL information of a Web page can be used on a browser using this changed URL file.

[0214]An example of this embodiment of operation is explained. First, mobile radio communication equipment assumes that it is operating as a terminal accommodated in A system. In this state, an executable file for a strange recovery (treatment module) currently performed by DSP410 supports A system, and is stored in the executable file storage 411. When a signal-processing procedure according to this executable file for a strange recovery is performed by DSP410, a function realized by this executable file is realized by mobile radio communication equipment.

[0215]On the other hand, a web browser which a user can use through the input-and-output device unit 7 at this time is the web browser A used only by A system. By control of the resource controller 4 which recognizes that mobile radio communication equipment is applying under A system. The executable file 601 for web browser A stored in the memory storage 5 is read in this controller 4, and browsing by the web browser A of it is made possible because CPU401 performs. Here, the one-shot function preselection capability of a registered Web page address peculiar to this web browser A is prepared for the web browser A by peculiar URL file 603 for web browser A.

[0216]If predetermined operation is performed on the input-and-output device unit 7 when it is thought that a user wants to peruse a Web page often perused on a screen of the web browser A, Peculiar URL file 603 for web browser A is referred to by the web browser A, and the list display of the favorite menu list (URL information list of favorite Web) in the web browser A is carried out. A user chooses and specifies a desired Web page out of a displayed favorite menu

list on the input-and-output device unit 7. Then, the signal processing device 3 is controlled by the resource controller 4, and URL information of this Web page is generated by DSP410. This URL information is passed to the radio-transmission-and-reception device 2, and is transmitted to a base station of A system. A website directed by this URL information on the Internet via an internet provider from this base station is accessed, and information on a Web page is read. Information on a read Web page follows a reverse course, and is transmitted to mobile radio communication equipment from a base station.

[0217]In mobile radio communication equipment, after information on a received Web page is sent to the signal processing device 3 via the radio-transmission-and-reception device 2 and is processed by DSP410, the resource controller 4 is passed. In the resource controller 4, information on the Web page which received is displayed on a screen of a display device in the input-and-output device unit 7 by processing of the web browser A by CPU401.

[0218]Thus, the user can peruse a favorite Web page by easy operation. A user presupposes that the Web page which is newly interested was discovered, perusing a Web page. The user can add the URL information of the discovered Web page to a favorite menu list. In that case, if a user performs register operation to a favorite menu list, The resource controller 4 adds a postscript to peculiar [CPU401 which is performing the web browser A] URL file 603 for web browser [which is read in the resource controller 4 in the new URL information concerned to register] A. Then, when a user ends use of the web browser A, CPU401 makes added peculiar URL file 603 for web browser A store in the memory storage 5. Peculiar URL file 603 for web browser A stored in the memory storage 5 is updated by this.

[0219]In this way, since it has a file format of the web browser A for exclusive use, it cannot be referred to by the web browser B, or updated peculiar URL file 603 for web browser A in the memory storage 5 cannot be updated. Then, peculiar URL file 603 for web browser A is changed into the file of common file form, and is stored in the memory storage 5 as the URL common file 610.

[0220]According to this embodiment, URL information of rewritten peculiar URL file 603 for web browser A is changed into form of the URL common file 610 by the translator A611 stored in the memory storage 5, and is managed. Even when an executable file for a strange recovery currently performed by DSP410 is changed into a file corresponding to B system from a file corresponding to A system by this and the web browser B comes to be used, it makes it possible to use URL information.

[0221][when a user specifically ended use of the web browser A], Or when an executable file for a strange recovery currently performed by DSP410 is changed into a file format corresponding to B system from a file format corresponding to A system and RAM402 is rewritten, CPU401 performs the translator A611. Thereby, peculiar URL file 603 for web browser A is changed into a common file format by the translator A611, and common URL file

610 is overwritten by file after this conversion.

[0222]Hereafter, drawing 54 explains a flow of this processing. As an initial state, a user who possessed mobile radio communication equipment is located in a service area of A system, and mobile radio communication equipment assumes that it is functioning as a terminal which suited A system. At this time, by the resource controller 4, an executable file for a strange recovery performed by DSP410 is changed into a file corresponding to B system stored in the executable file storage 411, and this change is recorded on RAM402 (Step S2011). Then, if a user moves and distance of A system and a base station separates, receiving field intensity of mobile radio communication equipment will become small, and it will become difficult for mobile radio communication equipment to function as a terminal of A system. At this time, a user is in a service area of B system, and mobile radio communication equipment presupposes that it is in the state where sufficient receiving field intensity is securable to a base station of B system. It can know that mobile radio communication equipment changed into the state where it becomes impossible to maintain a circuit with A system, and a circuit with B system can be instead secured as mentioned above.

[0223]It is confirmed whether, by this point in time, common URL file 610 is overwritten by the translator A611 according to peculiar URL file 603 for web browser A updated at the end (Step S2012). If not overwritten, the translator A611 will be performed by the resource controller 4. Thereby, peculiar URL file 603 for web browser A is changed into form of common URL file 610, and common URL file 610 is overwritten by file after conversion (Step S2013). Then, processing progresses to Step S2014. Although Step S2014 is not necessarily required processing, a "favorite" of web browser B is started by user at this step S2014.

[0224]In the following step S2015, the translator B612 is started, a file format of common URL file 610 is transformed into a file format of peculiar URL file 604 for web browser B by this translator B612, and this URL file 604 is generated or overwritten.

[0225]As mentioned above, an object for web browser A and peculiar URL files 603 and 604 for web browser B are described by file format which can be used by the web browser A corresponding, respectively and the web browser B. Therefore, if a peculiar URL file described by a file format of this exclusive use in the web browser A is not used, It cannot use for Web page specification, and similarly, by the web browser B, if a peculiar URL file described by a file format of this exclusive use is not used, even if it is found with much trouble and has registered with a file, a favorite Web page cannot be specified. By changing into a file format corresponding to a web browser which changes and saves a peculiar URL file at the URL common file 610 which is a common file format, and has the URL common file 610 used further, if this embodiment is followed. It becomes possible to use in the web browser. Thus, a list of Web pages based on a peculiar URL file for browsers can be used now. A user who shifted to B system from A system needs peculiar URL file 604 for web browser B for

displaying a favorite menu list in the web browser B used only by B system. Since peculiar URL file 604 for web browser B in which contents of change were reflected by conversion of a file format can be obtained according to this embodiment, When a favorite menu list is displayed, it becomes possible to reflect the contents of the favorite menu list updated by the web browser A used by A system as it is (Step S2016). The necessity that a user does individual management of such data is lost to a different radio communications system, and convenience improves greatly.

[0226]Although the object for web browser A and peculiar URL files 603 and 604 for web browser B presupposed that it exists on the memory storage 5 in above-mentioned explanation, These files 603 and 604 may be temporary files generated on the memory in the resource controller 4 ** and if needed.

[0227](A 13th embodiment) In the mobile radio communication equipment according to a 13th embodiment of this invention shown in drawing 55. The object for e-mail system A and the executable files 701 and 702 for e-mail system B, the object for e-mail system A and the peculiar receiving mailfiles 703 and 704 for e-mail system B, the reception mail common file 710, and the translators A711 and B712 are stored in the memory storage 5.

[0228]The executable files 701 and 702 are e-mail systems peculiar to A system and B system which are used only by A system and B system, respectively, i.e., the software for mailing used for E-mail transmission and reception. The executable files 701 and 702 are read into the resource controller 4, and a mailing function is realized by performing by this controller 4.

[0229]The mailfiles 703 and 704 are receiving mailfiles described in the inherent file form used with the executable files 701 and 702, respectively. On the other hand, the reception mail common file 710 is described in a predetermined common file form.

[0230]The translators A711 and B712 The reception mail common file 710, It is the file conversion application software for changing a file format mutually between peculiar receiving mailfiles with a peculiar file format in the e-mail system used with the radio communications system which the executable file for a strange recovery specifies. The translator A711 has the function to change the peculiar receiving mailfile 703 for e-mail system A which is a receiving mailfile peculiar to the mailing application software for A systems into the file format of the reception mail common file 710 which is a file format for common. Similarly, the translator B712 has the function to change the reception mail common file 710 into the peculiar receiving mailfile 703 for e-mail system A. These files 703 and 704 are read into the resource controller 4 by each, and the function is realized by performing by this controller 4.

[0231]As mentioned above, the peculiar receiving mailfile 703 for e-mail system A is described by the file format only for application software which can be used by the e-mail system A, The peculiar receiving mailfile 704 for e-mail system B is described by the file format only for application software which can be used by the e-mail system B.

[0232]Operation of this embodiment is explained. First, mobile radio communication equipment assumes that it is operating as a terminal accommodated in A system. In this state, the executable file for a strange recovery (treatment module) currently performed by DSP410 supports A system, and is stored in the executable file storage 411. When the signal-processing procedure according to this executable file for a strange recovery is performed by DSP410, the function realized by this executable file is realized by mobile radio communication equipment.

[0233]On the other hand, the e-mail system which the user uses through the input-and-output device unit 7 at this time is the e-mail system A only for A system. When the executable file 701 for e-mail system A stored in the memory storage 5 is read into the memory in the resource controller 4 which is not illustrated and is performed by CPU401 in the resource controller 4, the e-mail system A concerned is available.

[0234]A user advances the demand which shows on a display the menu list "reception mail" which is a list of the reception mail which it is sent to self-addressed until now, and has been saved at the memory storage 5 through the input-and-output device unit 7. CPU401 which received this demand displays on the display device in the input-and-output device unit 7 the contents of the peculiar receiving mailfile 703 for e-mail system A read from the memory storage 5 in the resource controller 4. Therefore, the inspection of reception mail is possible for a user, and if it sends a reply to this and there is mail which newly received a message, adding to this list is possible. In that case, the contents of new reception mail are added to the peculiar receiving mailfile 703 for e-mail system A first read into the memory in the resource controller 4 which is not illustrated by CPU401. When a user ends use of the e-mail system A next, CPU401 makes the added peculiar receiving mailfile 703 for e-mail system A store in the memory storage 5.

[0235]According to this embodiment, when mobile radio communication equipment shifts to another radio communications system, a file format is changed so that the receiving mailfile used until now can be used. Namely, when mobile radio communication equipment uses A system, it is received by the e-mail system A only for A system, When mobile radio communication equipment shifts to B system, it enables it to use the contents of the reception mail saved at the peculiar receiving mailfile 703 for e-mail system A also in the e-mail system B only for B system. For this reason, when the peculiar receiving mailfile 703 for e-mail system A is updated, Or after mobile radio communication equipment shifts to B system, the peculiar receiving mailfile 703 is changed into the form of the common receiving mailfile 420 by the translator A421 stored in the memory storage 5, and is managed by the common receiving mailfile 420.

[0236][when the user specifically ended use of the e-mail system A], Or when the executable file for a strange recovery currently performed by DSP410 is changed into the file

corresponding to B system from the file corresponding to A system and RAM402 is rewritten, CPU401 performs the translator A712. Thereby, the peculiar receiving mailfile 703 for e-mail system A is changed into a common file format by the translator A710, and the common receiving mailfile 420 is overwritten by the file after this conversion.

[0237]Hereafter, drawing 56 explains the flow of this processing. As an initial state, the user who possessed mobile radio communication equipment is located in the service area of A system, and mobile radio communication equipment assumes that it is functioning as a terminal which suited A system. At this time, by the resource controller 4, the executable file for a strange recovery performed by DSP410 is changed into the file corresponding to B system stored in the executable file storage 411, and this change is recorded on RAM402 (Step S2021). Then, if a user moves and the distance of A system and a base station separates, the receiving field intensity of mobile radio communication equipment will become small, and it will become difficult for mobile radio communication equipment to function as a terminal of A system. At this time, a user is in the service area of B system, and mobile radio communication equipment presupposes that it is in the state where sufficient receiving field intensity is securable to the base station of B system. It can know that mobile radio communication equipment changed into the state where it becomes impossible to maintain a circuit with A system, and a circuit with B system can be instead secured as mentioned above.

[0238]According to the peculiar receiving mailfile 703 for e-mail system A updated at the end by this point in time, it is confirmed whether the common receiving mailfile 710 is overwritten by the translator A712 (Step S2022) -- as mentioned above, At this time, a file format is changed from the inside of the peculiar receiving mailfile 703 for e-mail system A by the translator A712, and the common receiving mailfile 420 is overwritten according to a file after conversion (Step S2023). Then, processing progresses to Step S2024. Although Step S2024 is not necessarily required processing, at this step S2024, a "receiving box" of the e-mail system B is started by user.

[0239]The translator B712 is started in the following step S2025, A file format of the common receiving mailfile 420 is transformed into form of the peculiar receiving mailfile 704 for e-mail system B by the ** translator B712, and this receiving mailfile 704 is generated or overwritten (Step S2025).

[0240]As mentioned above, the peculiar receiving mailfile 704 for e-mail system B is described by file format which can be used by the e-mail system B. Therefore, the above-mentioned file conversion enables it to reflect the contents of the menu list "reception mail" updated by the e-mail system A as it is, when a user displays a menu list "receiving box" which is the reception mail list of the e-mail systems B (Step S2026). Different necessity that a user does individual management of such data for every radio communications system is lost, and convenience improves greatly.

[0241]Although an object for e-mail system A and the peculiar receiving mailfiles 703 and 704 for B shall exist on the memory storage 5 in the above-mentioned explanation, These files 703 and 704 may be temporary files generated on a memory in the resource controller 4 which is not illustrated if needed. The completely same management as the above is possible also about information on mail which put reception mail on transmitting mail, changed it by explanation mentioned above, and a user transmitted in the past. The completely same management as the above is possible also about a partner's mail address information that a user transmits and receives e-mail frequently.

[0242]

[Effect of the Invention]As explained above, according to this invention, ********** which performs resource management of a signal processing device exactly and efficiently can be provided.

[Translation done.]

TECHNICAL PROBLEM

[Problem to be solved by the invention]In a general design concept of mobile radio communication equipment, assignment of a resource is made fixed to two or more signal processing. Since the walkie-talkie must correspond to two or more radio communications system and two or more application services if this thought is applied to a software walkie-talkie, utilization efficiency of a resource falls remarkably. It mainly specializes in resource management looked at by computer in a memory area, and no consideration is made about resource management according to resource management and wireless quality on the basis of a hardware space.

[0007]In a software walkie-talkie, a software module is downloaded through a communication line and it saves at memory storage as indicated, for example to JP,H9-331579,A. Since a software walkie-talkie corresponds to new communications service, if download of a software module is repeated, quantity of a module saved at memory storage will increase. Since capacity of memory storage in a walkie-talkie is limited, it is necessary to delete an unnecessary module out of an already saved module in download actually. It must also take into consideration updating a module saved at memory storage corresponding to modular upgrade. It is inefficient to determine a module which should be deleted or updated with reference to a modular name and a version in memory storage for modular deletion or updating. Realization of a mechanism of managing a module efficiently is desired.

[0008]Generally in the application of the various kinds mentioned above which a software walkie-talkie can treat, carrying out the menu indication of the list of Web pages in which browsing is done by the user of a walkie-talkie, and the telephone number of this user's specific communications partner and the list of e-mail addresses is performed. However, generally, with the software walkie-talkie which can be equivalent to two or more radio communications systems, if the radio communications system to adapt is changed, the file of these lists cannot be used. The radio communications system provides the browser and e-mail

system by the original application service which the communications service company which employs this system, respectively defined, respectively, and original specification.

[0009]In order that the specifications of application service may differ for every radio communications system, the list file of a Web page, a telephone number, and a mail address must be prepared for every radio communications system. It is because the file format used by application service with the Reason peculiar to each radio communications system is a form peculiar to the application service. Therefore, in a software walkie-talkie, the list file of the Web page described by a certain file format which carried out radio communications system correspondence, a telephone number, and an e-mail address cannot be diverted to other radio communications systems. The user of a software walkie-talkie has to re-create newly the list file for the application services of the radio communications system, if the radio communications system to be used is changed. Furthermore, there is inconvenience that the user concerned must be alike according to two or more radio communications systems which may be used, and those list files must be managed.

[0010]The purpose of this invention is to provide the radio communication equipment which performs resource management of a signal processing device exactly and efficiently.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for solving problem]In order to solve above-mentioned SUBJECT, radio communication equipment applicable to two or more radio communications systems concerning the 1st mode of this invention is provided with the following.
The radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received.
The signal processing device constituted so that this resource might manage at least one modem function and a protocol function including the resource with which the function was defined and this resource might perform required signal processing with said transmission and reception.
The controller which supplies other modem functions and protocol functions respectively corresponding to said radio communications system to said signal processing device that it should redefine to said resource.

[0012]Radio communication equipment applicable to two or more radio communications systems concerning the 2nd mode of this invention is provided with the following.
The radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received.
The signal processing device constituted including the resource which can redefine a signal processing function so that this resource might perform signal processing of a required predetermined function with said transmission and reception.
The controller which controls said signal processing device according to resource quantity required to define the signal processing function newly required of said resource, and surplus resource quantity that said signal processing function newly demanded should be defined as said resource.

[0013]Radio communication equipment applicable to two or more radio communications systems concerning the 3rd mode of this invention is provided with the following.
The radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received.
The signal processing device constituted so that this resource might perform signal processing of a required predetermined function with said transmission and reception including the resource which can redefine a signal processing function according to a predetermined software module.
Memory storage constituted so that two or more software modules which corresponded to said two or more radio communications systems, respectively might be memorized.
the controller which controls said signal processing device and memory storage in order to read at least one software module corresponding to the predetermined radio communications system with which said radio communication equipment is applied from said memory storage and to give this software module that carried out reading appearance to said resource.

[0014]Radio communication equipment applicable to two or more radio communications systems concerning the 4th mode of this invention, The resource which can redefine a signal processing function is included according to the radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received, and a predetermined software module, The signal processing device constituted so that this resource might perform signal processing of a required predetermined function with said transmission and reception, Two or more software modules which corresponded to two or more signal processing functions which can be carried out by said signal processing device, respectively, Memory storage constituted so that the table which recorded the using history of each of this software module at least might be memorized, At least one software module corresponding to the signal processing function which should be made to perform to said signal processing device is read from said memory storage, this software module that carried out reading appearance is given to said signal processing device, and the controller which controls said signal processing device and memory storage is provided in order to rewrite further at least one software module memorized by said memory storage with reference to said table.
[0015]Radio communication equipment applicable to two or more radio communications systems concerning the 5th mode of this invention is provided with the following.
The radio-transmission-and-reception device constituted so that a radio signal might be transmitted and received.
The signal processing device constituted so that this resource might perform signal processing of a required predetermined function with said transmission and reception including the resource which can redefine a signal processing function according to a predetermined

software module.
Two or more software modules which corresponded to two or more signal processing functions which can be carried out by said signal processing device corresponding to two or more radio communications systems which can apply said radio communication equipment, respectively. Two or more 1st data files that have a file format corresponding to the peculiar application software prepared to each of each of said radio communications system, respectively, And memory storage constituted so that the 2nd data file with common file form might be memorized, The 1st conversion method for performing this conversion in order to change into said 2nd data file 1st at least one data file memorized by said memory storage and to newly store it in said memory storage, The 2nd conversion method for changing into said 1st at least one data file 2nd at least one data file memorized by said memory storage, the controller which controls said signal processing device and memory storage in order to read the software module corresponding to one predetermined radio communications system with which said radio communication equipment is applied from said memory storage and to give this software module that carried out reading appearance to said signal processing device.

[0016]
[Mode for carrying out the invention](A 1st embodiment) If drawing 1 (a) is referred to, in the mobile radio communication equipment according to this embodiment, RF (high frequency) signal from the base station which is not illustrated via the antenna 1 will be received, and the RF signal to this base station will be transmitted. The input signal from the antenna 1 is changed into a digital receiving IF (intermediate frequency) signal by the radio-transmission-and-reception device 2, and is supplied to the signal processing device 3 by it. The digital transmitting IF signal generated by the signal processing device 3 is changed into a transmitting RF signal by the radio-transmission-and-reception device 2, and is supplied to the antenna 1 by it.
[0017]Including LSI-ized hardware resources, such as a processor, a memory, and a logical circuit, the signal processing device 3 mainly performs processing of the modem unit 3A required for transmission and reception, and the protocol 3B, as shown in drawing 1 (b). The specification of the modem unit 3A and the protocol 3B, Concerning [for example,] a W-CDMA (Wide band code-division multiple access) system, It defines as TS 25 series of 3rd Generation Partnership Project (3GGP™), GSM (Global system for mobile communications) is defined by TS 05 series of 3GGP™.
[0018]Processing of the modem unit 3A (called a baseband unit) is signal processing in the field (baseband area) near the radio-transmission-and-reception device 2. More specifically, processing of the modem unit 3A is the processing which restores to sampled IF (intermediate frequency) signal which was digitized, and generates a receiving baseband signal and the

processing which modulates send data and generates a transmitting berth band signal which are outputted from the radio-transmission-and-reception device 2. Processing of the protocol unit 3B (called L2 / L3 protocol unit) is the protocol processing for which it opted according to the radio communications system with which mobile radio communication equipment is used.
[0019]The resource which the signal processing device 3 has is controlled by the resource controller 4. By this control, it can conform to the function of mobile radio communication equipment and the change of specification accompanying change of a service condition, and realization of the handover control accompanying movement between the radio communications systems which change with them is enabled easily. Specifically, the function of mobile radio communication equipment is changed into a request by performing change control of software, change control of a logical-circuit constitution method, or control of the both to the resource of the signal processing device 3 by the resource controller 4. Thus, by the resource which the signal processing device 3 has by the resource controller 4 being controlled accommodative, this resource with which quantity was restricted is used effectively.
[0020]The field which performs processing for which software processing is sufficient in capability among the resources of the signal processing device 3, The field where a general-purpose processor and a memory realize and a process speed is demanded is realized in hardware circuitry like DSP (digital signal processor) or PLD (programmable logic device). DSP is a basis of the control from the resource controller 4, and performs desired signal processing according to the program read from the memory storage 5. PLD is a basis of the control from the resource controller 4, and processes a request by describing circuitry according to the program read from the memory storage 5.
[0021]Databases, such as the processed data and the telephone directory like the software (module which is a component of a program and a program) used for the memory storage 5 with the signal processing device 3, and received data and send data, and an address book, are held. The memory storage 5 performs read/write of a required program or data by control from the resource controller 4 or the system controller 6 which controls the whole inside of mobile radio communication equipment. The program read from the memory storage 5 is described by the signal processing device 3. As the memory storage 5, a small hard disk drive apparatus or semiconductor memory like FROM is used.
[0022]The input-and-output device unit 7 connected to the system controller 6 includes the loudspeaker, keyboard, and display for the microphone for various kinds of I/O devices which manage an interface with the user of mobile radio communication equipment, for example, voice input, and voice response. A keyboard is used for a dialing key, function key operation, text input, editing operation, etc. Incoming information, contents, a menu, etc. are expressed as a display. The input-and-output device unit 7 has a USB interface for performing serial input/output between the MPEG interface which performs video compression elongation

processing further, and an external device. These components of the input-and-output device unit 7 are connected by an internal bus, and an internal bus is connected to the system controller 6.

[0023]An example of the concrete composition of the radio-transmission-and-reception device 2 in drawing 1 is shown in drawing 2. Explanation of a receiving system will lead RF input signal from the antenna 1 to the low noise amplifier 11 with the transmission-and-reception changeover switch (or duplexer) 10. the RF signal with which even the necessary level was amplified by LNA11 should pass BPF(band pass filter)12 -- it is inputted into the mixer 13 and a down convert is carried out by being mixed with 1st local signal LO11 for reception from the frequency synthesizer 20 here. The output signal from the mixer 13 is inputted into the mixer 16 through IF amplifier 14 and the band bus filter 15, and a down convert is carried out to a necessary intermediate frequency by being mixed with 2nd local signal LO12 for reception from the synthesizer 20 here. The output signal from the mixer 16 is inputted into A/D converter 18 through the low pass filter 17, and is changed into digital IF signal 19. IF signal 19 is inputted into the signal processing device 3.

[0024]In a transmission system, the digital IF signal outputted from the signal processing device 3, After being changed into an analog signal by D/A converter 22, it is inputted into the mixer 24 through the low pass filter 23, and upconverting is carried out by being mixed with 1st local signal LO21 for transmission from the synthesizer 20 here.

[0025]The output signal from the mixer 24 is inputted into the mixer 27 through the band bus filter 25 and IF amplifier 26, and upconverting is carried out to necessary RF frequency by being mixed with 2nd local signal LO22 for transmission from the synthesizer 20 here. After the RF output signal from the mixer 27 is amplified with the power amplifier 29 through the band pass filter 28, it is led to the antenna 1 by the switch 10, and is emitted as an electric wave from the antenna 1.

[0026]The signal processing device 3 in drawing 1 (a) includes the general-purpose processor (CPU) 31, the signal processing unit 32 (SPU), the memory 33, and the input/output interface 34, as shown, for example in drawing 3 (a). CPU31 performs processing according to the program given beforehand, and transmits a predetermined command and data to SPU32, and makes advanced signal processing perform to SPU32. On the contrary, CPU31 can change the contents of processing according to the command or trigger from SPU32.

[0027]The signal processing function of CPU31 and SPU32 is defined by installing a program in CPU31 and SPU32 by the resource controller 4. An assignment of the processing which CPU31 and SPU32 should perform is determined by the resource controller 4. In drawing 3, although it is described that the resource controller 4 is realized by the program which operates on CPU31, the sequencer on DSP or a logical circuit may also be realized.

[0028]SPU32 is the programmable exclusive processor which specialized in signal processing,

and either [at least] DSP or PLD is specifically used. SPU32 performs signal processing, using the memory 33 as a work memory. SPU32 performs the output of the signal with which the signal of the processing object was inputted and processed via the external interface 34 between the radio-transmission-and-reception device 2 and the system controller 6. As an example of the concrete contents of processing which SPU32 performs, "correlation operation", a "complex operation", "maximum detection", "the address translation of a memory", a "sequencer", "high-speed radial transfer", "accumulation", a "function operation", etc. are mentioned.

[0029]The case where the radio signal processing unit according to this embodiment is applied to a CDMA (code-division multiple access) system is explained concretely. The resource (back diffusion circuit resource) which performs back-diffusion-of-gas processing in a CDMA system to both SPU32 and CPU31 [SPU32 in the signal processing device 3 or], for example, becomes it from two or more logical circuits is prepared. This resource is controlled by the resource controller 4. In a CDMA system, the function of the RAKE receiver which operates to the finger timing according to multipass transmission, and the function which searchs finger timing periodically are needed. The search of finger timing is performed in consideration of the mobile communications environment where multipass timing is changed. Both these functions of both are realized by the back diffusion circuit including a correlation circuit, and a separate back diffusion circuit is assigned to both functions fixed in the former.

[0030]If this embodiment is followed, it is easy to be a constant period or to use for search processing the back diffusion circuit resource used for RAKE receiving by the resource management by the resource controller 4, at any time according to communication quality etc. If it carries out like this, quality communication will be secured by less circuit structure. In the CDMA receiver which receives two or more code channels, a back diffusion circuit resource is assigned to each channel by the resource management by the resource controller 4 according to connection/cutting of a code channel. If it carries out like this, a limited back diffusion circuit resource can realize RAKE receiving of a multiple channel, and it will become possible to reduce circuit structure.

[0031]SPU32 is constituted including two or more DSP37A and 37B, and PLD38, and these are connected by the internal bus 39 so that it may be illustrated by drawing 3 (b). DSP37A and 37B, and PLD38 can perform both processings of a back diffusion circuit resource. the case of this composition -- DSP37A and 37B, and PLD38 -- each throughput which it has, or a MIPS value corresponds to a part of resource of the signal processing device 3. In the example of a CDMA system, supposing the throughput of one back diffusion circuit is 10 [MIPS], DSP with the throughput of 100 [MIPS] can be treated as the same back-diffusion-of-gas resource as ten back diffusion circuits.

[0032]In order to realize the functions (RAKE receiving, a multipass search, peripheral cell

search, multi-channel reception, etc.) of the mobile radio communication equipment applied to a CDMA system, the resource controller 4, The total resource which the signal processing device 3 has is assigned so that the resource which DSP37A and 37B have may be applied to the total function of which it is required at the time. For example, when the resource which is total and is equivalent to 15 back diffusion circuits is required, PLD38 is made to pay the capability of ten back diffusion circuits, and the equivalent throughput of 100 [MIPS], and DSP37A or 37B is made to pay the capability of remaining five back diffusion circuits, and the equivalent throughput of 50 [MIPS]. The resource allocation of the signal processing device 3 is not restricted at the time of use with the same radio communications system. For example, a CDMA system and a TDMA (time-division multiple access) system, There are a TDMA system, an FDMA (frequency-division multiple access) system and an FDMA system, a CDMA system, and a processing element common then respectively. Resource allocation of the signal processing device 3 can be performed like the above about the processing which does not compete in time in common between these different **** radio communications systems.

[0033]Since reconstruction of a function is possible for the mobile radio communication equipment according to this embodiment with high flexibility as mentioned above, costs and development cycles required for a functional addition are reduced. The function of the modem unit 3A shown by drawing 1 (b) contained in the signal processing device 3 and the protocol unit 3B is required in the case of reconstruction of the function of mobile radio communication equipment. Thus, by carving the function of the signal processing device 3 into the modem unit 3A and the protocol unit 3B, it becomes easy to share the same function with two or more radio communications systems.

[0034]It is useful that the function of the modem unit 3A shown by drawing 1 (b) contained in the signal processing device 3 and the protocol unit 3B is freely reconstructible, when moved and used between the service areas of the radio communications system with which these mobile radio communication equipment differs. That is, according to the receive state of an electric wave and the congestion degree of a radio channel in a movement destination, mobile radio communication equipment can choose an available radio communications system the optimal, and can communicate under the selected system. Roaming and a handover become possible easily by this.

[0035]As shown in drawing 4, the general-purpose processor (CPU) 31 functions as the program sequencer (PS) 41 which manages program execution, and the arithmetic operation unit (ALU) 42. The signal processing unit (SPU) 32 shown in drawing 3 (a) performs a signal place according to a start or the sequence ended or programmed of processing by self, and supplies a trigger signal or an interrupt signal to CPU31. The trigger signal or interrupt signal supplied to CPU31 is detected by PS41. By this, CPU31 can recognize the state of SPU32, for example, "an end of signal processing", and can change the contents of processing of ALU42

based on the recognition. Thus, it becomes possible by carrying out coordination operation of CPU31 and SPU32, and making processing share with each to perform a complicated operation at high speed.

[0036]As shown in drawing 5, SPU32 has the arithmetic and logic unit (ALU) 51, the instruction memory 52, the data memory 53, and the input/output interface 54. ALU51 performs advanced signal processing, such as "correlation operation", "complex number operation", "array conversion", "maximum detection", "memory address conversion", a "sequencer", and "high-speed input and output", according to the input data from the outside, the data in the memory 33, and the processing instruction and data from CPU31. The processing result from ALU51 is written in the memory in data memory 33 and CPU31, a register and the memory 33, and the input/output interface 34. Thus, when a burden is performed about heavy advanced signal processing by SPU12 which is an exclusive processor for processing by CPU11, the burden of CPU11 is eased and processing speed improves.

[0037]The address conversion circuit for SPU32 is shown in drawing 6. An address conversion circuit is constituted by the two address decoders 61 and 62 of the memory 60, and necessary conversion patterns are written in, respectively. One side of the address decoders 61 and 62 is chosen with the command from SPU32, and the contents of decoding are changed. The register group 63 in the memory 60 is a memory cell in a memory like RAM (random access memory). It reads with the write-in address decoder with which the usual RAM is equipped, and the contents of decoding of an address decoder are the same. Therefore, if it is going to realize a bit array conversion process like the bit interleave contained in processing of SPU32 by the usual RAM, it is necessary to perform address computation for every read-out.

[0038]If according to drawing 6 the address decoders 61 and 62 are read with a write-in address decoder, respectively and it is used for an address decoder, such address computation becomes unnecessary and a conversion process like interleave with dramatically many throughputs can be performed at high speed. The address decoders 61 and 62 may be used as a device rewritable, respectively for example, like RAM, and an address mapping table may also be written in these. Since it can respond to two or more conversion patterns by this, the flexible processing corresponding to various patterns is realizable with simple composition.

[0039]As shown in drawing 3 (a), the data between CPU31 and SPU32 can also be direct delivered and received via the register array 36 in CPU31. Direct access of the register array 36 is carried out from SPU32. That is, SPU32 can write the data output from self in the register array 36 directly, and can also read data from the register array 36 directly. CPU31 can incorporate the contents of the register array 36, and can write data in the register array 36.

[0040]Thus, if the register array 36 is used for the data transfer of CPU31 and SPU32, CPU31 should just access the register array 36 regardless of the operation situation of SPU32 in data

transfer. Therefore, data transfer processing in CPU31 can be made quick, and processing of the signal processing device 3 can be accelerated.

[0041]The operation in the case of processing with the signal processing device 3 shown in drawing 3 (a) in response to the receiving IF signal digitized from the radio-transmission-and-reception device 2 with the input/output interface 34 is explained. If it is going to deal with an input signal only by CPU, many of arithmetic proficiency of CPU will be spent only by radial transfer, and only the remaining capability of CPU can be assigned to other processings. According to the signal processing device 3 shown in drawing 3 (a), the throughput of CPU31 can be put in making SPU32 carry out radial transfer without CPU31 to the processing of those other than radial transfer using the register array 36.

[0042]The receiving IF signal incorporated into the input/output interface 34 is incorporated into SPU32 one by one, and if fixed processing is required, necessary signal processing will be performed by SPU32. The processing result from SPU32 is written in the memory 33 or the register array 36. CPU31 performs required processing using the data written in the memory 33 or the register array 36.

[0043]Thus, the load of CPU31 can be made to reduce by making radial transfer and signal processing share with SPU32. In other words, signal processing high-speed as the signal processing device 3 whole is realized by making CPU31 and SPU32 distribute the processing load of the signal processing device 3. In order to plan much more load sharing, two or more CPUs are provided and it may be made to make each CPU distribute the processing made to share with CPU31 of drawing 3 (a).

[0044]Hereafter, other embodiments of this invention are described. In following embodiments, the fundamental composition of mobile radio communication equipment is the same as that of a 1st embodiment, and indicates other variations about the component or the mode of operation of mobile radio communication equipment.

[0045](A 2nd embodiment) The signal processing device 3 shown in drawing 7 has the circuitry description memory 71, the program sequencer 72, the programmable hardware device 73, and the memory 74. The programmable hardware device 73 is the hardware which can redefine circuitry, such as PLD and FPGA (fieldprogrammable gate array), and is an aggregate of the various logical circuits which perform the fundamental operation of signal processing. The programmable hardware device 73 may be a device which realizes a necessary processing capability as change being programmably possible in the combination of various logical circuits with a switch.

[0046]The circuitry description according to contents of processing for realizing a necessary signal processing function by combining programmably the various logical circuits in the programmable hardware device 73 with the circuitry description memory 71 is held. The program which shows the procedure of the processing which the programmable hardware

device 73 is made to perform is stored in the memory 74.

[0047]The program sequencer 72 receives the resource management program from the resource controller 4, A program is suitably read from the memory 74, the circuitry description memory 71 and the programmable hardware device 73 are controlled according to it, and the programmable hardware device 73 is made to perform signal processing according to this program.

[0048]In processors, such as general CPU and DSP, the circuitry of the ALU portion of the inside is immobilization. The dedicated communication circuit corresponding to each instruction set is constituted as ALU so that the contents of processing by the instruction set in which this processor was given can be realized. On the other hand, processing usually performed by ALU is realized in this embodiment by the programmable hardware device 73 which can redefine circuitry.

[0049]A circuitry description required to realize processing of the request to the programmable hardware device 73 is stored in the circuitry description memory 71 as a program. More specifically in the circuitry description memory 71. Fundamental processing called "4 Rule operation", the "data transfer", and the "bit shift" which are contained in usual ALU is added to the circuitry description for realizing by hardware, For example, the program which shows circuitry description, such as "correlation operation processing", "complex multiplication processing", "maximum detection processing", an "absolute value operation", for the usual processor to realize plural steps or ******** processing by hardware and circuitry description which shows the combination of elementary operation processing is stored. Whenever the signal processing function of the signal processing device 3 is newly defined by using such a circuitry description memory 71, circuitry description of the programmable hardware device 73 is changed so that the signal processing function can be realized.

[0050]Many programs for the above circuitry description to be performed to the memory 71 are described by the program area 74A on the memory 74. A required program is read from the block area 74A under control of the program sequencer 72, and it is given to the circuitry description memory 71. The circuitry of the programmable hardware device 73 is redefined by this.

[0051]Thus, according to this embodiment, processing of the signal processing device 3 is realized by the programmable hardware device 73 which can redefine circuitry. Therefore, in the usual processor which performs software processing, processing which also needs tens - hundreds steps can be performed at high speed within a number cycle, and, moreover, it can respond to the definition of various signal processing functions flexibly.

[0052](A 3rd embodiment) As for the signal processing device 3 shown in drawing 8, in addition to drawing 7, CPU75 is added. The circuitry description memory 71, the program sequencer 72, the programmable hardware device 73, and the memory 74 are fundamentally

[as what was explained by drawing 7] the same. However, complicated signal processing defined further beforehand is made to carry out the program sequencer 72 to the ** programmable hardware device 73 just here, It has a function which chooses a device corresponding to the contents of processing in order to make CPU75 carry out about the usual signal processing, and the function to perform control which operates programmable hardware device 73 and CPU75 simultaneously, and performs parallel processing.

[0053]In signal processing of the modem unit 3A especially shown in drawing 1 (b) of the signal processing device 3, By executing the resource management program from the resource controller 4 by the program sequencer 72, According to the signal processing function which should have the signal processing device 3, an assignment of the processing which programmable hardware device 73 and CPU75 should perform, respectively is determined. Circuitry description chosen from the memory 71 according to this determination is given to the programmable hardware device 73. Simultaneously, directions of the enforcement about the processing made to share with CPU75 from the program sequencer 72 are given to CPU75.

[0054]Signal processing in which it is complicated for CPU75 and a burden is heavy is performed by the above control by the program sequencer 72 with the programmable hardware device 73 which is a processor only for signal processing, and other processings are performed by CPU75 by it. Therefore, the time which the high speed processing of becomes possible, and can respond easily also to the signal processing function and change of design which should moreover have the signal processing device 3, and the new product development of mobile radio communication equipment takes is shortened.

[0055](A 4th embodiment) The signal processing device 3 shown in drawing 9 differs from the composition which having the two programmable hardware devices 73A and 73B showed to drawing 7. The function to perform control which makes processing share with these programmable hardware devices 73A and 73B is added to the program sequencer 72. It becomes possible to be able to change the processing capability of the signal processing device 3 with higher flexibility, and to perform more complicated signal processing by having such composition. The composition of this embodiment may be extended and it may have three or more programmable hardware devices.

[0056]The signal processing device 3 shown in drawing 9 is shown in drawing 10 still more concretely. To the program areas 74A and 74B in the memory 74, the program memory 80 and the data memory 81. The control circuit 92 corresponds to the program sequencer 72, the circuit description memory 83 is equivalent to the circuitry description memory 71, and SPU84 corresponds to the programmable hardware device 73, respectively.

[0057]A command and data from the resource controller 4 or the system controller 6 in an external device (a), i.e., drawing 1, It is incorporated in the signal processing device 3 via the

input register group 85, and the register group 86 is passed, it is held temporarily, it is sent out to the output register group 87, and SPU84 is passed.

[0058]It is assumed that the following processing programs are stored in the program memory 81, for example.

a=A+B (i)b=CxD (ii)(a, b) =(A, B) * (C, D) (iii) -- processing program (i), (ii), and (iii) of these express addition, multiplication, and complex multiplication, respectively. X of (X, Y) and Y express an element of real part of a complex number, and an imaginary part, respectively. * Express complex multiplication.

[0059]In the circuitry description memory 83, circuitry description for realizing each operation is recorded, According to the contents of the program stored in the program memory 80, the control circuit 82 is accessing the circuitry description memory 83, and rewrites circuitry description of SPU84 which is a programmable hardware device. Therefore, in an example of an above-mentioned processing program, an adder circuit, a multiplication circuit, and a complex multiplication circuit are formed in SPU84. Signal processing which SPU84 bears is not restricted to four operations, but any processings are possible for it if circuitry description is possible for correlation operation, the maximum, a minimum judging, etc. Since processing efficiency by rearranging to hardware organization only for the processing improves so that it is very complicated processing, much more high speed processing effect is enjoyed.

[0060](A 5th embodiment) drawing 11 -- being shown -- having -- as -- this invention -- the -- five -- an embodiment -- following -- a signal processing device -- three -- a hardware resource -- ****** -- a signal processing function -- redefinition -- being impossible -- a field -- three -- A -- being possible -- a field -- three -- B -- and -- a switch unit -- (-- SW --) -- 110 -- having . The logical circuit frequently used for the redefinition impossible field 3A, For example, the CRC addition (attach) block 101, the CRC-check block 102, Viterbi decoder 103, the turbo decoder 104, the correlator 105, the accumulator 106, the demodulator 107, and the deinterleaver 108 are mounted. The redefinition feasible region 3B comprises two or more PLD109 which are a component of FPGA. The switch unit 110 changes the connection between the field 3A and the field 3B, and connection of each block in the field 3B by control from the resource controller 4.

[0061]The connection state corresponding to a certain single radio communications system realized by the change of the switch unit 110 of the signal processing device 3 shown in drawing 11 is shown in drawing 12 and drawing 13. The input signal inputted into the signal processing device 3 is inputted into the correlator 105 and the demodulator 07, and the output signal from the correlator 105 is inputted into the accumulator 106. The output signal from the accumulator 106 is inputted into the demodulator 107. The output signal from the demodulator 107 is made into the output signal of the signal processing device 3 via the deinterleaver 108, Viterbi decoder 103, and the CRC-check block 102. In drawing 13, the equalizer 111 by which

function assignment was carried out to PLD109 is further added to drawing 12. An input signal is inputted into the demodulator 107 via the equalizer 111.

[0062]The example of wire connection whose correspondence in two radio communications system A of the signal processing device 3 and B was enabled is shown in drawing 14. The demodulator 107 is used in common with both systems A and B. Also in any of the systems A and B, the output signal from the demodulator 107 is inputted into the deinterleaver 108, and the output signal from the deinterleaver 108 is inputted into Viterbi decoder 103 in the system A, and it is inputted into the turbo decoder 104 in the system B, respectively. The output signal from Viterbi decoder 103 and the turbo decoder 104 is made into the output signal of the signal processing device 3 via the CRC-check block 102.

[0063]The resource size of the signal processing device 3 differs from the size of the fields 3A and 3B for every mobile radio communication equipment. In the mobile radio communication equipment in which some application service functions were installed, many signal processing functions are already defined as the resource of the signal processing device 3. The surplus resource quantity of the signal processing device 3 changes every moment according to the operating condition of mobile radio communication equipment.

[0064]The resource controller 4, An operating condition of the buffer 133 for storing temporarily the resource management table 130, the resource manager 131, the replacement system 132 that updates a resource of the signal processing device 3, and various kinds of data, as shown in drawing 15, and a resource of the signal processing device 3. It has the resource monitor system 34 for monitoring.

[0065]The resource manager 131 updates the resource management table 130 which is an operating condition list of resources based on a monitored result from the resource monitor system 34. The resource manager 131 grasps surplus resource quantity of the redefinition feasible region 3B of the signal processing device 3 based on a monitored result from referring to the resource management table 130 or the resource monitor system 34.

[0066]The resource manager 131 grasps resource quantity needed in the redefinition feasible region 3B, in order to carry out this functional definition to a resource of the signal processing device 3 based on composition descriptive information for realizing the new signal processing function by which an additional definition is carried out. In the resource manager 131, the new additional definition of a signal processing function to the redefinition feasible region 3B of a resource of the signal processing device 3 is performed using the update-of-resources device 132 according to this necessary resource quantity and surplus resource quantity.

[0067]According to this embodiment, even if it is in the environment where the resource of the signal processing device 3 to own differs from the operating condition of a resource, for every mobile radio communication equipment, according to the operating condition of the resource which changes every moment, it becomes possible to add a new signal processing function

efficiently. That is, the optimum allocation of a resource becomes possible by adding a new signal processing function using the information on the situation of the resource which oneself has already used.

[0068]The composition of the radio communications system which contained the mobile radio communication equipment 10 according to this embodiment as a terminal is shown in drawing 16. In this radio communications system, the composition descriptive information providing device 140 exists in a base station. The composition descriptive information providing device 140 provides the mobile radio communication equipment 10 with the information (henceforth composition descriptive information) which described the composition of the signal processing function by which an additional definition should be carried out to the resource of the signal processing device 3 in the mobile radio communication equipment 10.

[0069]In this example, the composition descriptive information providing device 140 has the buffer 143 for saving the antenna 141, the radio-transmission-and-reception device 142, and composition descriptive information, in order to provide the mobile radio communication equipment 10 with composition descriptive information by radio. The communication between the mobile radio communication equipment 10 and the composition descriptive information providing device 140 may be a cable. For example, what is necessary is just to use the composition descriptive information providing device 140 as equipment which performs the renewal of a function in the service center which updates the function of the mobile radio communication equipment 10.

[0070]The mobile radio communication equipment 10 has the antenna 1, the radio-transmission-and-reception device 2, the signal processing device 3, the resource controller 4 memory storage 5, the system controller 6, and the input-and-output device unit 7, as shown in drawing 1. The resource controller 4 has the resource monitor system 34 for monitoring an operating condition of a resource of the resource management table 130, the resource manager 131, the update-of-resources system 132, the buffer 133, and the signal processing device 3, as shown in drawing 15.

[0071]In the composition descriptive information providing device 140, composition descriptive information corresponding to a signal processing function newly added to the radio communication equipment 10 is read from the buffer 143. Read composition descriptive information is transmitted towards the mobile radio communication equipment 10 by the radio-transmission-and-reception device 142. Composition descriptive information which was transmitted to the mobile radio communication equipment 10, and came is received by the radio-transmission-and-reception device 2. In the resource controller 4, necessary resource quantity for the signal processing device 3 to realize a desired signal processing function is grasped based on received composition descriptive information. In the resource controller 4, surplus resource quantity for which the signal processing device 3 is not used is grasped

based on an operating condition of a resource currently monitored by the resource monitor system 134. The resource controller 4 performs optimal resource allocation to a signal processing function by which an additional definition should be carried out at a resource of the signal processing device 3 according to such necessary resource quantity and surplus resource quantity.

[0072]Other composition of the radio communications system having contained the mobile radio communication equipment 10 according to this embodiment is shown in drawing 17. In addition to the antenna 141, the radio-transmission-and-reception device 142, and the buffer 143 which were explained by drawing 16, the composition descriptive information providing device 140 has the resource controller 144 further. When the additional definition of the signal processing function new to the resource of the signal processing device 3 in the mobile radio communication equipment 10 should be carried out, The information which shows the operating condition of the resource of the signal processing device 3 currently monitored by the resource monitor system 134 is transmitted to the composition descriptive information providing device 140 via the antenna 1 by the radio-transmission-and-reception device 2.

[0073]In the composition descriptive information providing device 140, the composition descriptive information which shows the signal processing function which should newly be carried out an additional definition to the signal processing device 3 is read from the buffer 143. Based on this composition descriptive information, the necessary resource quantity for carrying out the additional definition of the signal processing function new to the resource of the signal processing device 3 by the resource controller 144 is grasped. In the resource controller 144, the surplus resource quantity of the signal processing device 3 is grasped based on the operating condition of the resource currently monitored by the resource monitor system 134. According to such necessary resource quantity and surplus resource quantity, the resource controller 144 asks the resource of the signal processing device 3 for the optimal resource allocation to the signal processing function by which an additional definition is carried out by an operation, and outputs resource allocation directions information to it. This resource allocation directions information is transmitted to the mobile radio communication equipment 10 via the antenna 141 by the radio-transmission-and-reception device 142.

[0074]It is received by the radio-transmission-and-reception device 2 via the antenna 1, and the resource allocation information transmitted to the mobile radio communication equipment 10 is passed to the resource controller 4. The resource controller 4 performs optimal resource allocation to the signal processing function by which an additional definition should be carried out at the resource of the signal processing device 3 according to resource allocation information. Thus, the operation for resource allocation is performed with the composition descriptive information providing device 140. That is, the operation needed in order to add a new signal processing function to the resource of the signal processing device 3 in the mobile

radio communication equipment 10 is performed in the exterior of the mobile radio communication equipment 10. Since the quantity of the operation performed by the resource controller 4 of the mobile radio communication equipment 10 decreases by this, it can contribute to low cost-ization of the mobile radio communication equipment 10. That is, when the processing which the resource allocation of the signal processing device 3 of a terminal requires is assisted by the base station, the processing load of the terminal which resource allocation takes is reduced.

[0075]Operation of this embodiment is explained with reference to drawing 18 - drawing 20. If drawing 18 is referred to, the mobile radio communication equipment 10 will receive first the composition descriptive information transmitted from the composition descriptive information providing device 140 (Step S101). In the mobile radio communication equipment 10, the necessary resource quantity which the additional definition of the signal processing function to the signal processing device 3 takes by the resource controller 4 using the received composition descriptive information is calculated (Step S102). Necessary resource quantity and the resource quantity (initial resource quantity) which the signal processing device 3 has at the time of shipment of the mobile radio communication equipment 10 are measured (Step S103). When necessary resource quantity is larger than the quantity of an initial resource, it is notified to the composition descriptive information providing device 140 that the additional definition of a signal processing function is impossible (Step S104).

[0076]When necessary resource quantity is smaller than initial resource quantity, in the resource controller 4, it grasps by the resource monitor system 134 (Step S105)., the present operating condition, for example, surplus resource quantity, of a resource of the signal processing device 3 The amount of surplus sources and necessary resource quantity are measured, and it is judged to the signal processing device 3 whether the additional definition of a new signal processing function is possible (Step S106). When an additional definition is possible, a new signal processing function is defined as the resource of the signal processing device 3 by the update-of-resources system 132 (Step S107). In Step S107, assignment of this resource of the signal processing function already defined as the signal processing device 3 is changed if needed. When the additional definition of a new signal processing function is impossible, that is notified to the composition descriptive information providing device 140 (Step S104). Processing of Step S103 may be omitted.

[0077]If drawing 19 is referred to, the processing from Step S201 to S204 is the same as processings from step SS101 in drawing 18 to S104. In Step S205, it is grasped as alike with reference to the resource management table 130, the present operating condition, for example, surplus resource quantity, of a resource of the signal processing device 3. In the following step S206, it is judged to the signal processing device 3 whether the additional definition of a new signal processing function is possible. When an additional definition is

possible, by the update-of-resources system 132, a new signal processing function is defined as the resource of the signal processing device 3 (Step S207), and the resource management table 130 is updated in connection with it (Step S208).

[0078]According to drawing 20, it is the same as processing of Steps S206 and S207 with step SS201 [in / with Step S301 to S305 / in processing of Steps S307 and S308 / drawing 19] to S204. At drawing 20, after processing of step S305 **, before defining a new signal processing function as the resource of the signal processing device 3 at Step S307, renewal of the resource management table 130 is performed at Step S306.

[0079]As mentioned above, generally the resource sizes of the signal processing device 3 differ for each mobile radio communication equipment of every. In connection with this, the composition and size of the redefinition impossible field 3A and the redefinition feasible region 3B which were illustrated to drawing 11 also differ from each other for each mobile radio communication equipment of every. Therefore, in order to perform efficiently resource allocation to the signal processing function of the signal processing device 3, it is necessary to grasp the number etc. of the CRC additional block 101 in the details of the resource which the signal processing device 3 has, for example, drawing 11, and the CRC-check block 102.

[0080]In the radio communications system shown in drawing 17, the resource controller 144 is formed in the composition descriptive information providing device 140 which are equipment other than mobile-radio-communication-equipment 10 which has the signal processing device 3. In this resource controller 144, to perform an operation required in order to carry out the additional definition of the signal processing function new to the resource of the item processing device 3 in ********** 10, this resource controller 144 grasps the details of the resource of the signal processing device 3.

[0081]Hereafter, the composition descriptive information providing device 140 is formed in a base station, and the mobile radio communication equipment 10 takes the radio communications system of drawing 17 which is a terminal for an example, How to grasp the details of the resource (henceforth a terminal resource) of the signal processing device 3 in the mobile radio communication equipment 10 in a base station is explained.

[0082]As shown in drawing 21, the layer composition (L1/L2: layer 1 / layer 2) in the usual base station has data link control (DLC) and a physical layer (PHY). DLC has media access control (MAC), an error control block (EC), and a radio resource controller (RRC). In a base station, an error control block (EC) receives the data sent from the upper layer, and signal processing is performed in order to have the tolerance over the error generated with a radio-transmission-and-reception device. The signal outputted from the error control block (EC) is sent to media access control (MAC). The signal outputted from MAC is sent to a physical layer (PHY). In PHY, signal processing for abnormal conditions is performed and the RF signal for presenting wireless transmission is generated. EC, MAC, and PHY are controlled by a radio

resource controller (RRC). On the contrary, when a base station receives the sending signal from a terminal, processing is performed in the reverse order of the flow of an above-mentioned signal.

[0083]The layer composition in the base station of the radio communications system according to this embodiment is shown in drawing 22. The controller which newly controls a terminal resource in L1 / L2 layer composition shown in drawing 21 is added to drawing 22. Specifically, TRC (Terminal Resource Control) is added as a component of DLC (Data LinkControl). TRC communicates with RRC (Radio Resource Control) uniquely, and acquires the body number or machine kind information of a terminal by it. That is, TRC acquires the body number or machine kind information of a terminal by monitoring communication between a terminal and a base station.

[0084]A method of using a table is mentioned as one of the methods which grasps a resource which a terminal owns from a body number or terminal species information. An example of such a table is shown in drawing 23. A resource list which showed details of a terminal resource in a table is referred to. in a resource list, quantity of a functional block name and each functional block is written, and concurrent use is still more nearly improper to it so that it may be illustrated by drawing 24 -- like -- special affairs are indicated. A resource is divided into a redefinition impossible field and a redefinition feasible region as mentioned above.

[0085]TRC grasps necessary resource quantity for defining a desired signal processing function as a terminal resource using information on a resource list which was illustrated to drawing 24, asks for optimal resource allocation by an operation, and outputs resource allocation directions information. Resource allocation directions information is transmitted to a terminal from a base station. A table shown in drawing 23 is updated whenever a new terminal is released.

[0086]The layer composition of a base station (BS) and a terminal (MT) according to this embodiment is shown in drawing 25. TRC is provided in base station BS and a resource controller (RC) is formed in terminal MT, respectively. TRC has a resource list of each terminal. Terminal resources differ for every terminal. RC has a resource management table showing the operating condition of a terminal resource. The rates of the redefinition impossible field of a terminal resource and a redefinition feasible region differ for every terminal. The operating condition of a terminal resource is monitored by a resource monitor system.

[0087]TRC provided in base station BS communicates between RC provided in terminal MT, and acquires the information on the operating condition of a terminal resource from a terminal. TRC transmits a message as shown in drawing 26 to RRC, for example, in order to grasp the operating condition of a terminal resource. It is required that RRC of base station BS will notify the operating condition of a terminal resource to a base station to RC provided in terminal MT if this message is received. If this demand is received, RC of terminal MT will update the table

of the operating condition of a terminal resource, and will transmit the table concerned to base station BS. TRC of base station BS has a resource list of terminal MT, and grasps the kind and quantity of a resource which terminal MT owns with this list. Therefore, the resource operating condition table sent to base station BS from MT terminal is simplified by the table on which only the numerical value was described according to the turn defined beforehand, as shown in drawing 27. RRC which received the operating condition table of this resource transmits a message as shown in drawing 28 to TRC with which the base station was equipped.

[0088]By the above procedure, TRC can grasp the operating condition of a terminal resource. Using the information on a body number or a terminal kind, the resource which the terminal owns is grasped and the operating condition of a terminal resource is further acquired from a terminal. TRC asks for the optimal resource allocation that is needed for the newly added function by an operation based on these information further, and outputs resource allocation directions information. This resource allocation directions information is transmitted to a terminal from a base station.

[0089]In the terminal which can change a signal processing function, the amount of the resource used changes one by one. That is, the case where a part of function once set as the terminal becomes unnecessary may happen. Therefore, resource management based on the newest information can be performed by performing renewal of a resource management table, when adding a function.

[0090]What is necessary is just to add the mechanism of transmitting the additional definition of the function having been impossible for from the mobile radio communication equipment 10 to the composition descriptive information providing device 140, in the radio communications system shown, for example in drawing 16, in order to notify a terminal that the addition of the signal processing function was impossible for. the time of carrying out the additional definition of the signal processing function -- the additional definition of all the signal processing functions -- being alike -- a resource may be insufficient. In such a case, a base station can grasp that the additional definition of a new signal processing function was impossible for at the terminal side. In a base station, grasp of this purport will transmit composition descriptive information so that the additional definition of the signal processing function of the minimum according to surplus resource quantity in the terminal side can be performed. The improvement in service as a radio communications system is attained by such minimum additional definition.

[0091](A 6th embodiment) Mobile radio communication equipment according to a 6th embodiment of this invention is shown in drawing 29. This mobile radio communication equipment has the antenna 1, the radio-transmission-and-reception device 2, the signal processing device 3, the resource controller 4, and the memory storage 5 like an old embodiment. In drawing 29, the system controller 6 and the input-and-output device unit 7

which were shown in drawing 1 are omitted.

[0092]The signal processing device 3 is constituted by programmable hardware device like a processor which performs signal processing by software or PLD like CPU or DSP, for example. If a case where the signal processing device 3 is a processor is taken for an example, this processor will have a storage area like a RAM area where an execution program is read, and signal processing will be performed by reading a module group which constitutes a program for performing signal processing to this storage area. A module here is a file of compiled executable code, and each signal processing function is software-module-ized.

[0093]The program and the data file are stored in the memory storage 5. Especially as a program, the module group the specification in the signal processing device 3 is assumed to be is stored. The module group which is needed when the mobile radio communication equipment concerned changes by this, without another mode, for example, the mode in which another channel is received, can be read from the memory storage 5, and the signal processing device 3 can be passed.

[0094]The example of the storage area of the signal processing device 3 and the contents of the memory storage 5 is shown in drawing 30. The signal processing device 3 has DSP210 as a processor, and the voice transmission module 211 and the voice receiving module 212 are read into the storage area. The data transmission module 221, the equalizer module 222, the Viterbi decoder module 223, and the CRC module 224 are stored in the memory storage 5.

[0095]The resource controller 4 has the source management table 200, the resource manager 201, the resource rewriting processor 202, and the download buffer 203. The information on the preservation place of the module which can be performed with the signal processing device 3 is memorized by the resource management table 200. The resource manager 201 controls an order of replacing the (a) resource, and the timing to (c) judgment whether it changes or not and (b) Replace. The resource rewriting processor 202 rewrites a module with the directions from the resource manager 201 to the processor of the signal processing device 3 stored in the memory storage 5. The download buffer 203 stores temporarily the module downloaded from the outside.

[0096]Fundamental operation of the mobile radio communication equipment according to this embodiment is the same as that of the embodiment described until now, and the characteristic operation is as follows. The radio transmission line between the base stations which are not illustrated with mobile radio communication equipment by shadowing, i.e., mobile radio communication equipment, going into a place behind something etc. deteriorates, and it carries out to having stopped fulfilling desired communication quality. Communication quality is detected by the electric-field measurement function which the radio-transmission-and-reception device 2 has, for example.

[0097]If desired communication quality is no longer fulfilled, it will be judged that the resource

controller 4 newly needs to build an equalizer module into the resource of the signal processing device 3 in order to aim at improvement in communication quality. If the resource of the signal processing device 3 has a margin in the resource controller 4 based on this judgment, the resource manager 201 will perform control which builds an equalizer module into this resource. The resource manager 201 checks whether an equalizer module exists in the memory storage 5 by referring to the resource management table 200.

[0098]If the equalizer module 222 is in the memory storage 5 as shown in drawing 30, the resource controller 4 will read it into the signal processing device 3 as an executable file of the processor which is the signal processing device 3. If there is no equalizer module into the memory storage 5, the resource controller 4 advances a download request, acquires this module, and stores it in the download buffer 203.

[0099]When the required module is not stored in the memory storage 5 with the signal processing device 3 in mobile radio communication equipment, a download request is advanced to the base station in which mobile radio communication equipment has the area which is carrying out the current position as a service area. A base station is transmitted to the network which does not illustrate the received download request. A network transmits the demanded module to the mobile radio communication equipment which advanced the download request via a base station.

[0100]Thus, by replacing the program held in the storage area of the processor which is the signal processing device 3, a required signal processing function is defined as the signal processing device 3. It is incorporated only when a required module is required as a program. A waste of the resource by an unnecessary module thereby usually residing in the storage area of a processor permanently, i.e., unnecessary occupancy of a memory resource, can be suppressed. Therefore, it can respond to the roaming and the hand-off between different radio communications systems, aiming at effective use of the resource which has restriction in capacity.

[0101]Next, the more concrete example of the mobile radio communication equipment according to this embodiment of operation is explained. First, the case where a communicative classification is changed is described as mobile radio communication equipment is changed from the state which was being used for the voice call to the state of using for data communications like browsing of Web.

[0102]When it is going to change a communicative classification from a voice call to data communications, it becomes unnecessary, the module, for example, the voice CODEC module, for voice calls, and the module which newly mounted TCP/IP instead of it is needed. The resource manager 201 checks whether a TCP/IP module exists in the memory storage 5 with reference to the resource management table 200. It [with / a TCP/IP module] is read in the memory storage 5 in the storage area of a processor as an executable file of the processor

which is the signal processing device 3. A module for voice calls like the voice CODEC module which became unnecessary is cleared from the storage area of this processor.

[0103]The resource manager 201 acquires by download which was mentioned above when there was no TCP/IP module in the memory storage 5. After the acquired TCP/IP module is saved at the memory storage 5, it is written in the resource management table 200. the resource manager 201 checks whether it resembles the memory storage 5 again and a TCP/IP module exists with the resource management table 200. If a TCP/IP module exists in the memory storage 5, it will be read into the storage area of a processor as an executable file. Thereby, data communications become possible henceforth.

[0104]Drawing 31 and drawing 32 explain this operation. As shown in drawing 31, the voice transmission module 211 and the voice receiving module 212 are read into a storage area of the signal processing device 3 like drawing 30. The data transmission module 221, the data receiving module 225, the voice transmission module 226, and the voice receiving module 227 are stored in the memory storage 5.

[0105]In the first step S401, DSP210 uses the voice transmission module 211 and the voice receiving module 212, and is performing signal processing for a voice call. It is in this state and suppose that the user of mobile radio communication equipment operated the input-and-output device unit 7 shown in drawing 1, and next directed data-communications shift. The resource controller 4 advances an update-of-resources demand in response to these directions (Step S402). Thereby, the resource manager 201 of the resource controller 4 confirms whether a data-communications module is in the memory storage 5 with reference to the resource management table 200 (Step S403). When there is no data-communications module into the memory storage 5, a download request is advanced, in a certain case, it rewrites to DSP210, and a start is notified (Step S404). This stops execution of a certain module by DSP210 to the storage area now.

[0106]Next, the resource controller 4 deletes a certain voice transmission module and a voice receiving module to the storage area of DSP210 now using the rewriting processor 202, A data transmission module and a data receiving module are read from the memory storage 5, and it is made to write in the storage area of DSP210 (Step S405). If the rewriting processing by the rewriting processor 202 is completed, the resource controller 4 will be rewritten to DSP210 and will perform a terminating notice (Step S406). In response to a rewriting terminating notice, DSP210 performs the data transmission module and data receiving module in the storage area, and performs signal processing for data communications (Step S407).

[0107]Thus, a module in a storage area (memory resource which DSP210 has) of DSP210 is changed to a basis of management of the resource controller 4. Thereby, a signal processing function of DSP210 is changed into a function of data communications from a function of a voice call, and exchange of a signal processing function can be realized, using beneficially a

storage area of limited capacity which DSP210 has. Therefore, occupancy of a memory resource by an unnecessary module is suppressed.

[0108]According to the example of drawing 33, it replaces with the signal processing device 3 at DSP, and a programmable hardware device, for example, PLD230, is programmably used for rewriting. PLD230 is operating by the module group 231 (for example, the module A, B, and C, D), and the module group 240 (for example, the module A, B, and C, D, E, F, --) use by PLD231 is assumed to be is stored in the memory storage 5. It is as [a module said here is a module of a circuitry program (circuitry description), for example,] it is shown in a layout wiring figure of PLD.

[0109]If operation is explained using drawing 34, PLD230 is performing signal processing first using the module A, B, and C for building the circuitry which performs signal processing for a voice call, and D (Step S501). Suppose that the input-and-output device unit 7 shown in drawing 1 was operated, and data-communications shift was directed in this state noting that the user wanted to perform data communications. The resource controller 4 advances an update-of-resources demand in response to these directions (Step S502). It is assumed that the module B, C, and D is a module for building the circuitry about required signal processing also in any of a voice call and data communications.

[0110]In data communications, since it is memorized beforehand that the module B, C, and D and E are required, it knows that the resource controller 4 needs to change the module A to the module E by investigating the present configuration of module in PLD230. The resource manager 201 of the resource controller 4 confirms whether there is the module E for building the circuitry which performs signal processing for data communications to the memory storage 5 with reference to the resource management table 200 (Step S503) (Step S504).

[0111]When the module E is in the memory storage 5, the resource manager 201 gives the directions which rewrite the module A in the module group 231 currently held PLD230 to the module E to the rewriting processor 202. In response to these rewriting directions, the rewriting processor 202 performs a modular rewriting start notice to PLD230 (Step S505). Thereby, PLD230 stops the processing execution by the circuitry by the module held now. Next, the rewriting processor 202 cancels the module A which PLD230 holds, reads the module E from the memory storage 5 instead, and replaces with the module A (Step S506).

[0112]Thus, if it rewrites and the module rewriting processing of PLD230 by the processor 202 is completed, the resource controller 4 will be rewritten to PLD230 and will perform a terminating notice (Step S507). In response to this rewriting terminating notice, PLD230 builds circuitry using the module group 231 (the module B, C, and D, E) newly held, and performs signal processing of data communications using that circuitry (Step S508).

[0113]On the other hand, when there is no module E in the memory storage 5 in Step S504, the resource controller 4 advances a download request (Step S509). The module E downloads

and it is temporarily held by this demand at the download buffer 203. Then, it rewrites to PLD230 at Step S505, and a start is notified (Step S505). Thereby, at Step S506, the module E held at the download buffer 203 rewrites, and it is read by the processor 202, and is written in PLD230.

[0114]Downloading in this way, after download finishes, the module E promptly downloaded to PLD230 can be written in, and it becomes possible from a voice call to shift to data communications for a short time. The module acquired by download is saved at the memory storage 5 if needed, and it is not only temporarily stored in the download buffer 203, but is appropriated for the future use.

[0115](A 7th embodiment) According to a 6th embodiment, the module is replaced with the unnecessary module in the change of the signal processing function of the signal processing device 3 for realizing a new signal processing function among two or more required modules. When preparing the module group which made the module required according to a use the set, respectively and changing a signal processing function, it may change per module group. It enables this to switch the signal processing function of the signal processing device 3 at high speed.

[0116]The mobile radio communication equipment according to a 7th embodiment that replaces such a module group unit is shown in drawing 35. This mobile radio communication equipment can be adapted for several different radio communications systems. Therefore, the module group 241,242 for performing signal processing for communication with a different radio communications system is stored in the memory storage 5. These module groups 241,242 can be updated by exchanging the memory storage 5. DSP210 of the signal processing device 3 reads the module group 213, and is operating.

[0117]It assumes that mobile radio communication equipment is communicating with the base station with the present radio communications system X now, and in order to perform a handover in this state, suppose that it needed to communicate with the base station by radio communications system Y. In this case, the resource manager 201 judges that the necessity that mobile radio communication equipment performs communication with radio communications system Y occurred, and controls an order of replacing a resource, judgment whether it changes or not, the timing to replace, etc. The resource manager 202 opens wide the module which is not used by the system X, rewrites directions of incorporating the module for system Y, and takes out to the processor 202. The rewriting processor 202 performs modular rewriting processing from the memory storage 5 to DSP210 in response to these directions.

[0118]Here, since the radio communications system X is under use still now, what is used among module groups for system X currently written in a storage area of DSP210 needs to leave it. Then, a module which is not used is investigated, the module is wide opened from a

storage area of DSP210, and a module for system Y is built into a storage area as a surplus resource which this produced. Thereby, mobile radio communication equipment becomes possible [communicating with both radio communications systems X and Y].

[0119]Operation in a case of opening the module X1 wide and reading the module Y1 from a state where signal processing is performed using the module X1 for DSP210 to communicate under the system X, X2, X3, and X4, using drawing 36, in order to communicate under the system Y is explained.

[0120]First, in Step S601, the module X1 for communicating under the system X, X2, X3, and X4 are written in a storage area of DSP210, and DSP210 is performing signal processing using the module X1, X2, X3, and X4. It is in this state, and if a handover arises, for example, the resource controller 4 will generate a module update request (Step S602). The resource manager 201 checks a check of whether in response to this module update request, the memory storage 5 has a module group for communications system Y with reference to the resource management table 200, and composition of a module group for communications system X (Step S603).

[0121]The resource manager 201 judges judgment which [of judgment of a module required for communication by radio communications system Y, and the module groups for radio communications system X] is replaced, and an order of replacing a resource. As this result, the resource manager 201 judges that the module X1 is required for needlessness and the module Y1, and should write in the X1 deletion-back Y1. The resource manager 201 gives directions of the purport that the module X1 in the module group 213 currently held DSP210 is rewritten to the module Y1, to the rewriting processor 202. The rewriting processor 202 performs a modular rewriting start notice to DSP210 in response to these directions (Step S604). Thereby, DSP210 stops the processing execution by the module held now.

[0122]Next, the rewriting processor 202 cancels the module X1 of the module groups 213 currently held DSP210, reads the module Y1 from the memory storage 5 instead, and replaces with the module X1 (Step S605). If this rewriting processing is completed, the resource controller 4 will be rewritten to DSP210 and will perform a terminating notice (Step S606). DSP210 performs signal processing for data communications using the module group 213 (the module X2, X3, X4, Y1) currently held in response to this notice (Step S607).

[0123]By thus, the thing for which the module in DSP210 is changed to the basis of management of the resource controller 4. The module storage area (capacity limited memory resource) of DSP210 is utilized effectively, and it becomes possible to perform communication which was being performed only under the communications system X until now with the communications systems X and Y. Thereby, a handover is easily realizable.

[0124]Another example of operation in this embodiment is explained using drawing 37. It is assumed that mobile radio communication equipment is communicating under radio

communications system U. When a handover is performed so that mobile radio communication equipment may communicate under another radio communications system V on the boundary of a cell (namely, service area), A module is selectively replaced so that the resource of DSP210 which is the signal processing device currently used by radio communications system U may be gradually used by radio communications system V. By carrying out like this, the soft hand over between different radio communications systems becomes possible.

[0125]It is made to be gradually occupied from the state where the module read into DSP210 is specifically occupied by the system U by the system V. About the module for system V, if beforehand stored in the memory storage 5, it will be used, and it will be acquired by download if there is nothing.

[0126]The state which is communicating under radio communications system U in drawing 37 (it is Step S701 and suppose that the hand-off arose and the module update request occurred (Step S702).) In Step S701, the module U1, U2, U3, and U4 are written in the storage area as the module group 213, and DSP210 assumes that signal processing is performed using these modules.

[0127]The resource manager 201 refers to the resource management table 200 which memorized the preservation place etc. of the module which can be performed by DSP210, An order of replacing a resource, judgment whether it changes or not, the timing to replace, etc. are judged, it rewrites to rewriting processor 202 and DSP210 based on the judgment, and a start is notified (Step S703- S704). This stops the processing execution by the module group 213 held now by DSP210. The module group 213 already written in DSP210 at this time, As shown in Step S705, it is the module U1 for performing signal processing for the communication under the system U altogether, U2, U3, and U4, and the module for performing signal processing for communication by the system V is not contained.

[0128]Then, the rewriting processor 202 opens the storage area of the module U1 first so that it may rewrite gradually the module group 213 currently written in DSP210 under control by the resource manager 202. Next, the rewriting processor 202 writes in the module V1 read from the memory storage 5 to the field opened wide (Step S706). Next, the rewriting processor 202 writes in the module V2 which opened the storage area of the module U2 wide, and read it from the memory storage 5 to the field opened wide (Step S707). The module V3 which it next rewrote, and the processor 202 opened the storage area of the module U3 wide like the following, and was read from the memory storage 5 to the field opened wide is written in (Step S708). Next, the rewriting processor 202 writes in the module V4 which opened the storage area of the module U4 wide, and read it from the memory storage 5 to the field opened wide (Step S709).

[0129]Thus, under control by the resource manager 201, the module to the storage area of DSP210 is gradually rewritten by the rewriting processor 202. If required all are rewritten, the

resource manager 201 will rewrite to DSP210 and will perform a terminating notice (Step S710). DSP210 which received this notice processes data communications using the module group 213 (the module V1, V2, V3, V4) held now (Step S711).

[0130]Thus, the module group 213 in DSP210 is gradually changed to the basis of management of the resource controller 4 corresponding to the signal processing function of which it is required. It is got blocked by this, utilizing effectively the module storing region (capacity limited memory resource) of DSP210, and the soft hand over between different radio communications systems is made possible, suppressing occupancy of the resource by an unnecessary module.

[0131](An 8th embodiment) As shown in drawing 38, the common hardware resource 232 is prepared for the programmable hardware device 3, for example, the signal processing device which used PLD230, in the mobile radio communication equipment according to a 7th embodiment of this invention. The common hardware device 232 may be hardware different from PLD230, and may be a part of PLD230 [3A], for example, the redefinition impossible field shown in drawing 11.

[0132]Mobile radio communication equipment may need to monitor another radio communications system in the state where it is communicating under a certain radio communications system. In such a case, in this embodiment, a part of module group 231 read into PLD230 is opened wide, and some newly monitored modules for radio communications systems are incorporated. The procedure of this opening and inclusion may be the same as the procedure explained by a 7th embodiment.

[0133]The common hardware device 232 is a device used common to two or more radio communications systems. Therefore, this device 232 is used in common under the radio communications system which mobile radio communication equipment is using for communication, and another radio communications system which it is going to monitor. The processing burden of the resource of PLD230 is eased by using the common hardware device 232.

[0134]Thus, also in the composition which uses a programmable hardware device like PLD230 for the signal processing device 3, By incorporating or changing the module which is circuitry description for changing the circuitry of PLD230 to the storage area of PLD230 if needed, when monitoring a radio communications system. Occupancy of the resource of PLD230 by an unnecessary module is suppressed, and effective use of a resource can be performed.

[0135](A 9th embodiment) In the mobile radio communication equipment according to a 9th embodiment of this invention shown in drawing 39, the executable file 214 common to two or more radio communications systems is stored in the signal processing device 3. Mobile radio communication equipment considers the case where another radio communications system is monitored in the state where it is communicating under a certain radio communications system

that an 8th embodiment described the same way. In such a case, a part of module group 213 read into DSP210 is wide opened like the procedure explained by a 7th embodiment, and some newly monitored modules for radio communications systems are incorporated.

[0136]The fixed common executable file 214 is used common to each radio communications system. Therefore, this executable file 214 is used in common under the radio communications system which mobile radio communication equipment is using for communication, and another radio communications system which it is going to monitor. The processing burden of the resource of DSP210 is eased by using the common executable file 214.

[0137](A 10th embodiment) According to the mobile radio communication equipment according to a 10th embodiment of this invention shown in drawing 40 (a), the resource controller 4, It has the module management table 300, the module manager 301, the module rewriting processor 302, and the download buffer 303. The signal processing device 3 has the program memory 311 in which the program (henceforth a treatment module) which shows the signal-processing procedure of DSP310 and DSP310 was stored in this example. The signal processing device 3 is replaced with DSP, and a programmable hardware device like PLA and FPGA may realize, In that case, the software module which described the circuitry of the programmable hardware device is stored in program memory as a treatment module.

[0138]The state of preservation of the treatment module used with mobile radio communication equipment, the quota state of the treatment module to the resource of the signal processing device 3, and the using history of a treatment module are recorded by resource controller 4 self, and the module management table 300 is updated, and is used. The module management table 300 has the module state-of-preservation table 3001, the module quota status table 3002, and the module using history table 3003 at least, as shown in drawing 40 (b).

[0139]The state of preservation of a treatment module is managed by the module state-of-preservation table 3001. The quota state to the resource of a treatment module is managed with the module quota status table 3002. The information on the using history of a treatment module including the modular quota state information and state-of-preservation information on a resource is managed by the module using history table 3003. The module manager 301 records the information on the using history of a treatment module on the module management table 300, and performs preservation of a treatment module, deletion, and updating using this module management table 300.

[0140]The download buffer 303 is a buffer space used since the downloaded treatment module is temporarily saved when a treatment module is downloaded from a wireless circuit. The module rewriting processor 302 notifies assignment of the treatment module from the memory storage 5 to the signal processing device 3, and a rewriting start and end of a treatment module with the directions from the module manager 301. The signal processing device 3 to

which the treatment module was assigned by the module rewriting processor 302 incorporates the assigned treatment module from the memory storage 5, and performs the signal-processing procedure described by the treatment module.

[0141]The display device 321 and the input device 322 are shown as a component of the input-and-output device unit 7 by drawing 40 (a). Mobile radio communication equipment and the connectable external storage 9 are prepared if needed via the interface 8 and this interface 8.

[0142]Next, operation of the mobile radio communication equipment according to this embodiment is explained. The signal processing device 3 presupposes that it has DSP310 and the program memory 311 as shown in drawing 40 (a). Now, at the point in which the user of mobile radio communication equipment is located, two sorts of radio communications systems (it is considered as the system A and the system B) provide service, respectively, and presuppose that those radio communications systems suited under the available situation with mobile radio communication equipment.

[0143]Suppose that the user performed specification using desired radio communications system, for example, A system, by the key operation of the input device 321 in mobile radio communication equipment. A system use specification information generated by this operation is incorporated into the resource controller 4. The resource controller 4 recognizes the state of preservation of the treatment module needed under specified A system, and the quota state to the resource of the signal processing device 3 with reference to the module management table 300. As a result, if required treatment modules are insufficient, the download request of that treatment module that runs short will be generated.

[0144]This download request generated by the resource controller 4 is transmitted to a base station from the radio-transmission-and-reception device 2 via the channel for control currently prepared, for example as a channel common to each radio communications system. In a base station, the server or base station in a base station reads the treatment module shown by the received download request from the server provided on the network to which it is connected, and it transmits to the mobile radio communication equipment of a requiring agency.

[0145]It is received by the radio-transmission-and-reception device 2, and the treatment module transmitted to mobile radio communication equipment from the base station is passed to the resource controller 4. In this way, it was received, that is, once the downloaded treatment module is held by the resource controller 4 at the download buffer 303, it is transmitted and saved at the memory storage 5.

[0146]Next, in the resource controller 4, a treatment module quota demand is advanced from the module manager 301 to the module rewriting processor 302. The module rewriting processor 302 reads a required treatment module from the memory storage 5 according to this treatment module quota demand, and performs control written in the program memory 311 of

the signal processing device 3. In the signal processing device 3, that DSP310 performs the treatment module written in the program memory 311 realizes signal processing which becomes settled with the treatment module. Therefore, the user of the mobile radio communication equipment concerned can use the new function by the treatment module written in the program memory 311.

[0147]In performing control which reads a required treatment module from the memory storage 5, and is written in the program memory 311, the module manager 301 utilizes the limited memory space of the program memory 311 effectively as follows. With reference to the contents of the module using history table 3003 currently recorded on the module management table 300, an exchange order of a treatment module over the program memory 311, judgment whether it changes or not, exchange timing, etc. are controlled.

[0148]The module manager 301 performs control for performing deletion of the unnecessary treatment module of various kinds of treatment modules currently held further at the memory storage 5, upgrade of the treatment module currently held, etc. When treatment modules required for processing next to the signal processing device 3 are insufficient in the program memory 311 as a result of this control, the module manager 301 generates a treatment module quota demand.

[0149]A treatment module quota demand is given to the module rewriting processor 302, and a required treatment module is written in the program memory 311 by this processor 302. In the signal processing device 3, the treatment module written in the program memory 311 in this way is performed DSP310. The function realized with the treatment module written in program memory 311 by this is realized by mobile radio communication equipment. That is, the new function by the treatment module newly written in the program memory 311 is added to the mobile radio communication equipment concerned.

[0150]Two or more treatment modules can be written in the program memory 311 of the signal processing device 3. At the signal processing device 3, arbitrary treatment modules are performed by DSP310 in the state where two or more treatment modules were made to coexist in the program memory 311. Each of capacity of the program memory 311 and capacity of the memory storage 5 is limited. Since an order of replacing the treatment module in the signal processing device 3, judgment whether it changes or not, and the timing to replace are controlled by the module manager 301, the situation which runs short of the capacity of the program memory 311 can be controlled.

[0151]If the treatment module is saved at the memory storage 5 whenever mobile radio communication equipment downloads a new treatment module, an empty storage area of the memory storage 5 may be insufficient soon. If an empty storage area is lost to the memory storage 5, it is necessary to delete other treatment modules saved at the memory storage 5, to be vacant, and to secure a storage area. In that case, it is desirable to be deleted from a

treatment module which is not required for mobile radio communication equipment, i.e., a treatment module with low probability used for next time with mobile radio communication equipment. For this reason, frequency in use of a treatment module used in the past is always supervised by the module manager 301, and a monitored result is recorded on the module using history table 3003 of the module management table 300. A treatment module with least frequency in use is deleted on the module using history table 3003 by the module manager 301. Thereby, an empty storage area of the memory storage 5 is secured, and is saved in the downloaded new treatment module at the memory storage 5.

[0152]A list of items described by the module using history table 3003 in the module management table 300 is shown in drawing 41 (a). Items of a module using history are a module name, module size, frequency in use, a state of preservation and a quota state, and ******. A module name is a name of a treatment module. Module size is the capacity of the memory storage 5 required to save a treatment module. Frequency in use is the number of times which uses a treatment module with mobile radio communication equipment. A state of preservation is information which shows the state where the treatment module is saved in a storage area, if this treatment module is saved, it is specifically an address of the program memory 311, and if it is not saved, it is NO. It is the information which shows whether a treatment module is assigned to the program memory 311, and if a quota state is assigned, it turns on, and if not assigned, it will be set to OFF.

[0153]Although the treatment module of OFF of a resource quota state is saved at the memory storage 5, it is not assigned to the program memory 311. The treatment module which should be deleted is chosen from the treatment module of OFF of a resource quota state. When all the treatment modules are assigned to the program memory 311, the treatment module which should be deleted is deleted after assignment to the program memory 311 is opened wide.

[0154]The concrete example of contents of the module using history table 3003 is shown in drawing 41 (b). In this example, there are QPSK modulation, correlator, convolutional-code-izing, PN-code-izing, and Walsh coding as a module name. Module sizes are 10200Byte, 15300Byte, 12900Byte, 25000Byte, and 18000Byte, respectively, Frequency in use is 320 times, 230 times, 202 times, 23 times, and 98 times, respectively, Preservation places are the 0x100th NO(s) [0x400th / 0x5000th / 0x3000th] (however, 0x shows the hexadecimal notation), respectively, and it is shown that quota states are ON, ON, OFF, OFF, and OFF, respectively.

[0155]With reference to drawing 42, the procedure which deletes the unnecessary treatment module in the memory storage 5 is explained using the use frequency information recorded on the module using history table 3003 shown in drawing 41 (b). This procedure is performed by the module manager 301. Refer to the frequency in use for a start of modular deletion among the items currently recorded on the module using history table 3003 (Step S702). (Step S701)

It assigns by this reference, and in the treatment module of OFF, a state looks for a treatment module with least frequency in use, and gives the directions which delete that treatment module from the memory storage 5 to the resource controller 4. The resource controller 4 deletes the treatment module in which deletion was directed from the inside of the memory storage 5 (Step S703). The module manager 301 deletes the hysteresis information of the deleted treatment module from the module using history table 3003 (Step S704). Operation of Steps S702-S704 is repeated until it is judged that the availability required of Step S705 was secured.

[0156]For example, when the example of contents of the module using history table 300 shown in drawing 41 (b) is followed, there is least frequency in use of the Walsch coding among convolutional-code-izing which is a treatment module of OFF of a quota state, PN-code-izing, and the Walsch coding. Therefore, the treatment module of this Walsch coding is deleted. The hysteresis information of the treatment module of the Walsch mark is deleted from the module using history table 3003. In this way, reservation of capacity required for the memory storage 5 will terminate deletion of a treatment module (Step S706). As a result, the contents of the module using history table 3003 shown in drawing 41 (b) are updated as shown in drawing 41 (c).

[0157]In such a procedure, a frequently-used treatment module, i.e., a treatment module with a high possibility of being used for the next, is saved by deleting a treatment module by the module manager 301 at the memory storage 5. Therefore, since download processing is no longer recklessly performed about a treatment module with a high possibility of being used, the processing load of mobile radio communication equipment is reduced.

[0158]Next, the case where the module using history table shown in drawing 43 (a) - 43 (c) is used is explained. As the list of the items described by the module using history table 3003 is shown in drawing 43 (a), the item of a module using history is the same as that of drawing 41 (a) except frequency in use being transposed to the newest use time, and being. The newest use time is the newest time stamp that specifically wrote the treatment module read from the memory storage 5 in the program memory 311. As shown in drawing 43 (b), the example of contents of the module using history table 3003, Except that 2005/04/14-2005/12/21-2003/05/04, 2005/02/03, and 2005/08/14, are filled in as a use updated date, it is the same as that of drawing 41 (a).

[0159]With reference to drawing 44, the procedure which deletes the unnecessary treatment module in the memory storage 5 is explained using the information on the newest use time recorded on the module using history table 3003 shown in drawing 43 (b). This procedure is performed by the module manager 301. Refer to the newest use time for a start of modular deletion among the items currently recorded on the module using history table 3003 (Step S802). (Step S801) It assigns by this reference, and in the treatment module of "OFF", a state

looks for a treatment module with the oldest newest use time, and gives the directions which delete that treatment module from the memory storage 5 to the resource controller 4. The resource controller 4 deletes the treatment module in which deletion was directed from the inside of the memory storage 5 (Step S803). The module manager 301 deletes the hysteresis information of the deleted treatment module from the module using history table 3003 (Step S804). Operation of Steps S802-S804 is repeated until it is judged that the availability required of Step S805 in the memory storage 5 was secured.

[0160]For example, when an example of contents of the module using history table 300 shown in drawing 43 (b) is followed, the newest use time of convolutional-code-izing is the oldest among convolutional-code-izing which is a treatment module of OFF of a quota state, PN-code-izing, and the Walsch coding. Therefore, a treatment module of this convolutional-code-izing is deleted from the inside of the memory storage 5, and hysteresis information of a treatment module of convolutional-code-izing is deleted from the module using history table 3003. In this way, reservation of capacity required for the memory storage 5 will terminate deletion of a treatment module (Step S806). As a result, the contents of the module using history table 3003 shown in drawing 43 (b) are updated as shown in drawing 43 (c).

[0161]In such a procedure, a treatment module with the new newest use time, i.e., a treatment module with a high possibility of being used for the next, is saved by deleting a treatment module by the module manager 301 at the memory storage 5. Therefore, since download processing is no longer recklessly performed about a treatment module with a high possibility of being used, the processing load of mobile radio communication equipment is reduced. When mobile radio communication equipment is used by user who changes his use actual condition frequently, the addition and deletion of the useless treatment module which is not adapted to the use actual condition are attained.

[0162]Next, the case where the module using history table shown in drawing 45 (a) - 45 (c) is used is explained. As the list of the items described by the module using history table 3003 is shown in drawing 45 (a), the item of a module using history is the same as that of drawing 41 (a) and drawing 43 (a), except that frequency in use or the newest use time is deleted.

[0163]With reference to drawing 46, the procedure which deletes the unnecessary treatment module in the memory storage 5 is explained using the information on the module size recorded on the module using history table 3003 shown in drawing 44 (b). This procedure is performed by the module manager 301. Refer to the module size for a start of modular deletion among the items currently recorded on the module using history table 3003 (Step S902). (Step S901) It assigns by this reference, and in the treatment module of "OFF", a state looks for a treatment module with the largest module size, and gives the directions which delete that treatment module from the memory storage 5 to the resource controller 4.

[0164]The resource controller 4 deletes the treatment module in which deletion was directed

from the inside of the memory storage 5 (Step S903). The module manager 301 deletes the hysteresis information of the deleted treatment module from the module using history table 3003 (Step S904). Operation of Steps S902-S904 is repeated until it is judged that the availability required of Step S905 was secured.

[0165]For example, when the example of contents of the module using history table 300 shown in drawing 45 (b) is followed, the module size of the Walsh coding is the largest among convolutional-code-izing which is a treatment module of OFF of a quota state, PN-code-izing, and the Walsch coding. Therefore, the treatment module of this Walsh coding is deleted from the inside of the memory storage 5, and the hysteresis information of the treatment module of the Walsh coding is deleted from the module using history table 3003. In this way, reservation of capacity required for the memory storage 5 will terminate deletion of a treatment module (Step S906). As a result, the contents of the module using history table 3003 shown in drawing 45 (b) are updated as shown in drawing 45 (c).

[0166]In such a procedure, by deleting a treatment module by the module manager 301, a quota state is OFF and a treatment module with large module size is deleted sequentially from the memory storage 5. Therefore, a required empty storage area is secured on the memory storage 5. By deleting a treatment module with the biggest size, a possibility that a field more than size of a required storage area will be secured by one deleting operation becomes high on the memory storage 5. Thereby, deleting operation of a treatment module can be managed with the minimum number of times, and a processing load required for deletion is reduced.

[0167]Next, an example considered as composition which added a function to investigate and save version information of a treatment module which mobile radio communication equipment uses on the module using history table 3003 is explained.

[0168]As a list of items described by the module using history table 3003 is shown in drawing 47 (a), it is the same as that of drawing 41 (a) and drawing 43 (a) except replacing with frequency in use or the newest use time, and having a version in an item of a module using history. A version is the revision information of a treatment module. For example, as shown in drawing 47 (b), a version of QPSK modulation, correlator, convolutional-code-izing, PN-code-izing, and the Walsh coding presupposes that it is 2.1, 1.3, 3.1, and 2.3 and 1.8.

[0169]With reference to drawing 48, the procedure which updates the module in the memory storage 5 to a higher version is explained using the information on the version shown in drawing 47 (b). If a modular update process begins and a modular update request, i.e., the utilization request of a new treatment module, is inputted into the module manager 301 (Steps S1001-S1002). The module manager 301 investigates whether a required treatment module exists in the memory storage 5 with reference to the contents of the module using history table 3003 in the module management table 300 (Step S1003) (Step S1004).

[0170]If a required treatment module does not exist in the memory storage 5, the treatment

module of a required version is downloaded from a wireless circuit (Step S1005), and it is saved at the memory storage 5 (Step 1006). since the treatment module of a new version is newly saved by this at the memory storage 5, the module rewriting processor 302 includes the new treatment module in the memory storage 5 next -- ** -- a required treatment module is written in the program memory 311 (Step S1010).

[0171]On the other hand, if a required treatment module exists in the memory storage 5 as a result of the check in Step S1004, The module manager 301 compares the version of the treatment module of the memory storage 5 with the version of an actually required treatment module with reference to the module using history table 3003 (Step S1007). If the version of the treatment module of the memory storage 5 is equal to the version of a required treatment module as a result of this comparison, a required treatment module will be loaded from the memory storage 5, and it will write in the program memory 311 (Step S1010).

[0172]If the version of the treatment module in Step S1007 saved at the memory storage 5 as a result of the check is old, The treatment module of a version more nearly required than a wireless circuit is downloaded (Step S1008), and it changes for the treatment module of the old version which exists in the memory storage 5 (Step S1009). Since the treatment module in the memory storage 5 is updated now by the new version, the module rewriting processor 301 writes the required treatment module in the memory storage 5 in the program memory 311 next (Step S1010). If processing of Step S1010 is performed, the version update process of a treatment module will be ended (Step S1011).

[0173]Here, it considers using the convolutional code-ized treatment module which is not assigned to the program memory 311 according to the example of contents of the module using history table 3003 shown, for example in drawing 47 (b). The version of the convolutional code-ized treatment module needed presupposes that it is 4.0. The module manager 301 gets to know that the convolutional code-ized treatment module is saved at the memory storage 5 with reference to the module using history table 3003. The version of the convolutional code-ized treatment module saved at the memory storage 10 is 3.1, and the module using history table 3003 shows that it is older than the version 4.0 needed.

[0174]Then, the module manager 301 requires that the convolutional code-ized treatment module of the version 4.0 should be downloaded to the radio-transmission-and-reception device 2. The convolutional code-ized treatment module of the version 4.0 which this downloaded via the radio-transmission-and-reception device 2 is replaced with the old original treatment module, and is saved at the recording equipment 5. Simultaneously, the module using history table 3003 is updated. Then, a new treatment module is assigned to the program memory 311. Thus, the version of a treatment module required whenever it uses a treatment module, and the treatment module saved for the memory measure 5 is compared, and a version will be updated if the version of the treatment module in the memory storage 5 is old.

[0175]Next, the user using mobile radio communication equipment itself explains the example which chooses the treatment module which should be deleted and secures the availability of the memory storage 5. In order to make it possible to choose the treatment module which a user should delete in person, or to input the instructions which delete the this chosen treatment module, the display device 321 and the input device 322 with which the input-and-output device unit 7 was equipped are used. As the input device 322, a keyboard, a cursor key and a keystroke device like a cross key, the touch panel installed in the display surface of the display device 321, or a pointing device is used. When it is set as the mode in which a user secures the empty storage area in the memory storage 5, the module name of the treatment module held now, and module size and the state of the present assignment are displayed on the display device 321. The user can choose and specify the treatment module for deletion, being able to see this display. For this reason, the module manager 301, The function to manage the module using history table 3003 in the module management table 300, With reference to the contents of this table 3003, it has at least the function to extract the module name of each treatment module held now at the memory storage 5, and the information on module size and state ** of the present assignment. The resource controller 4 has a function to which these information that the module manager 301 extracted is displayed on the display device 321, and the function to delete the treatment module which was specified when a user operated the input device 322 according to this display and which should be deleted from the memory storage 5.

[0176]The function in which the module manager 301 supervises the existence of insufficient generating of the treatment module in the (a) program memory 311, (b) When treatment modules run short, refer to the module using history table 3003, It has a function which controls deletion of the treatment module in an order which the treatment module in the program memory 311 replaces, judgment whether it changes or not and the function which controls the timing to replace, and the (c) memory storage 5, and upgrade. If a treatment module quota demand is given from the module manager 301 to the module rewriting processor 302, this processor 302 will write the treatment module obtained by download by a wireless circuit, or loading from the memory storage 5 in the program memory 311. In this way, when the signal-processing procedure (treatment module) written in the program memory 311 is performed by DSP310, the function realized with the written-in treatment module is realized by mobile radio communication equipment.

[0177]The information on the file capacity of a correspondence treatment module is attached to the module name in the module using history table 3003. When the module manager 301 assigns a treatment module to the program memory 311 using the information on this file capacity or a treatment module is replaced, It has the function to rewrite the information on a quota state of the applicable treatment module of the module using history table 3003, and to

grasp the actual condition. When the mode in which the module manager 301 manages the availability of the memory storage 5 according to this function is set up, the information which should be displayed on the display device 321 is acquired with reference to the module using history table 3003. The resource controller 4 displays on the display device 321 this information that the module manager 301 acquired in a predetermined format.

[0178]The alter operation result by the user from the input device 322 is recognized by the resource controller 4 which is CPU. Based on this recognition result, deletion from the memory storage 5 of the shift to the mode selected by the resource controller 4, the selected designation of a module name, and the treatment module of the selected module name is performed.

[0179]The user can replace a treatment module by inputting the directions which choose a desired radio communications system via the input device 322. If use of a radio communications system with a user, for example, A system, is specified via the input device 322, this specification information will be incorporated into the resource controller 4. The module manager 301 gets to know the information on the treatment module which refers to the module management table 300 including the contents of the module using history table 3003, and needs it in specified A system from the module management table 300.

[0180]The module manager 301 from the information on the module management table 300. The state of preservation of the treatment module used now and the quota state to the resource (program memory 311) of the signal processing device 3 are got to know, and if it is recognized as treatment modules being insufficient, the download request about the treatment module which runs short will be generated. This download request is sent to a base station via the radio-transmission-and-reception device 2 from the resource controller 4. In a base station, the treatment module shown by the received download request is read from a server, and it transmits to the mobile radio communication equipment of a requiring agency.

[0181]It is received by the radio-transmission-and-reception device 2, and the treatment module transmitted to mobile radio communication equipment from the base station is passed to the resource controller 4. In this way, it was received, that is, the downloaded treatment module is once held by the resource controller 4 at the download buffer 303. At this time, the availability of the memory storage 5 is checked by the resource controller 4.If there is sufficient availability to save the treatment module held at the download buffer 303 as a result of this check, from the download buffer 303, a treatment module is read and it is saved at the memory storage 5. In connection with this, the contents of the module using history table 3003 are updated by the module manager 301.

[0182]When there is not sufficient availability for the memory storage 5 as a result of the above-mentioned check, After a storage area is secured by deleting other treatment modules saved by the module manager 301 at the memory storage 5, the treatment module read from

the download buffer 303 is held at the memory storage 5. That is, when the availabilities of the memory storage 5 run short, or when a demand to secure an availability occurs, the module manager 301 extracts the information on all the treatment modules which the memory storage 5 holds with reference to the contents of the module using history table 3003. The display device 321 is controlled by the module manager 301 based on this information, and the list display of the module name of a treatment module, module size, and the state (the present utilizing state) is carried out. The user can know now whether it is a module name of the treatment module currently held at the memory storage 5, capacity, and that each treatment module is used, respectively from this display. A state is not using a user from this display, i.e., he looks for the treatment module in which the quota state serves as OFF. If a quota state finds the treatment module used as OFF, a user will choose the module of the request of them using the input device 322, and will direct deletion of the selected treatment module further. According to these directions, the applicable treatment module in the memory storage 5 is deleted by the resource controller 4. The information about the deleted treatment module is deleted from the module using history table 3003 by the module manager 301.

[0183]A flow of the above processing is explained using drawing 49. When a user specifies a mode of deletion of an unnecessary treatment module by operation of the input device 322, processing of drawing 49 is performed by the module manager 301. When modular deletion begins (Step S1101), the module manager 301, Required information is extracted and it is made to display on the display device 321 from inside of information currently recorded on this table 3003 with reference to the module using history table 3003 (Step S1102) (Step S1103). If a user chooses a treatment module to delete from this display information by operation of the input device 322 and specifies it (Step S1104), the module manager 301 will delete that treatment module by which selected designation was carried out from the memory storage 5 (Step S1105).

[0184]The list of items and the concrete example of contents of this table 3003 which were described by the same module using history table 3003 as the example quoted until now are shown in drawing 50 (a) and drawing 50 (b). The example of the display screen of the hysteresis information in the display device 321 in Step S1103 is shown in drawing 50 (c). In this example of a display screen, the module name of the treatment module saved at the memory storage 5 now, the size of this module, and the present state are displayed. It means whether an applicable treatment module is using a state with mobile radio communication equipment, and - will be displayed if it is not [be / it] under use.

[0185]Specification of the treatment module for deletion is performed in inputting the number which shows the module name for deletion in the bottom on the display screen of drawing 50 (c) with the input device 322. Then, if definite reference operation is carried out, that specified treatment module will be deleted from the inside of the memory storage 5 by the module

rewriting processor 302 controlled by the module manager 4. It is desirable for a quota state to specify one of the treatment modules of OFF as a treatment module for deletion. What is necessary is to choose one module which the quota state chose from among the treatment modules of ON suitably, and just to delete, after opening the treatment module wide when there is no treatment module of OFF of a quota state.

[0186]Thus, if the specified treatment module is deleted, the contents of the module using history table 3003 will be updated by the module manager 301 (Step S1106). Step S1102 - operation of 1106 are repeated until it is judged that the availability required of Step S1107 in the memory storage 5 was secured. If a required availability is secured, deletion of a treatment module will be ended (Step S1108). Thus, the information about the treatment module saved in the memory storage 5 is displayed with the display device 321, and the signal processing function of the signal processing device 3 can be chosen because the user of mobile radio communication equipment itself chooses the treatment module for deletion with reference to this. Therefore, mobile radio communication equipment is customizable to the function which suited the user's usage pattern.

[0187]In the above-mentioned explanation, a required treatment module is supplied from the network side via the download from a wireless circuit, i.e., a base station, with mobile radio communication equipment. It is also possible to, make the mass external storage 9 mobile radio communication equipment connectable via the interface 8 on the other hand, as shown in drawing 40 (a), and to incorporate a required treatment module into the memory storage 5 in mobile radio communication equipment from this external storage 9. By this, when it needs the treatment module running short and the treatment module of a new version, mobile radio communication equipment, Download from other than a wireless circuit can be performed, and also backup of an important treatment module is realizable by making the treatment module saved at the memory storage 5 in mobile radio communication equipment transmit and hold to the external storage 9. As the external storage 9, a semiconductor memory card, a hard disk drive, MO (Magnetic-Optical disk drive), a CD-ROM drive, CD-R / RW drive, a DVD drive, etc. are used, for example.

[0188]In the above-mentioned explanation, deletion of the treatment module in the memory storage 5 is performed on the basis of one of two or more items (for example, frequency in use, the newest use time, and module size) recorded on the module using history table 3003. It may enable it to choose the arbitrary items used as the standard which deletes a treatment module out of two or more recorded items on the other hand for user itself of mobile radio communication equipment. Management of the treatment module which this set by various usage patterns is attained by the user itself.

[0189](An 11th embodiment) The mobile radio communication equipment according to an 11th embodiment of this invention is shown in drawing 51. In each following embodiment, since it is

easy, two radio communications systems (A system and B system) provide service, for example, and mobile radio communication equipment shifts to the arbitrary systems of A system and the B systems, and presupposes that it is available. A system and B system are radio communications systems which a communication enterprise A company and B company provide, respectively. The mobile radio communication equipment shown in drawing 51 makes one telephone directory usable as a telephone directory file which has the form only for application software peculiar to each system by A system and B system.

[0190]The signal processing device 2 has the executable file storage 311 which stores the executable file for a strange recovery (treatment module) in which immediate execution is possible by DSP310 and this DSP310. The resource controller 4 has CPU401 and RAM402 which record the present management state of the resource of the signal processing device 2. A keyboard for the display which performs presenting of the variety of information to a user, etc., and a user to do an operational input, and an input device like a cursor key are included in the input-and-output device unit 7.

[0191]In the memory storage 5. The executable file 501 for call management system A and the peculiar telephone number file 503, the executable file 502 for call management system B and the peculiar telephone number file 504, the common telephone number file 510, the translator A511, and the translator B512 are stored.

[0192]The executable file 501 for call management system A is application software used only by A system, and the peculiar telephone number file 503 is a telephone directory file for these application software. Similarly, the executable file 502 for call management system B is application software only in B system, and the peculiar telephone number file 504 is a telephone directory file for these application software.

[0193]The peculiar telephone number file 503 for call management system A is described by the file format which can be used only by call management system A. Similarly, the peculiar telephone number file 504 for call management system B is described by the file format which can be used only by call management system B. Therefore, these peculiar telephone number files 503 and 504 cannot be diverted to a call management system different, respectively.

[0194]The common telephone number file 510 is a different telephone directory file (telephone number list file) which is described as for the common file format, for example, text file form, in the peculiar telephone number files 503 and 504 for object [for system A], and system B. This file 510 is a file which does not enable use of the above-mentioned application software in mobile radio communication equipment even if used as it is.

[0195]The executable files 501 and 502 for object [for call management system A] and call management system B are the application software for the management about a telephone call, and have the following functions. The executable files 501 and 502 carry out the list display of the telephone number list registered into this file 503 respectively with reference to

the peculiar telephone number files 503 and 504 the object for call management system A which is a telephone directory, and for call management system A, or indicate by search. If selected designation of the desired telephone number is carried out by user's operation out of the telephone number displayed further, the dial call of the executable files 501 and 502 will be carried out to the telephone number. The executable files 501 and 502 can also perform addition to the telephone directory of a telephone number in which a user newly wishes to add, and deletion of an unnecessary telephone number. When such application software has shift of a radio communications system, and when there is change to the peculiar telephone number files 503 and 504, a file is changed using a translator and the function controlled that the contents should be updated is given.

[0196]The translator A511 and the translator B512 are software which carries out the conversion process of the file format. This translator A511 and the translator B512, It is used in order to carry out the interconversion of a file between the common telephone number file 510 which is a common list file, and a list file peculiar to the application used with the radio communications system which the executable file for a strange recovery specifies.

[0197]Namely, the translator A511 changes a list file peculiar to the application software for A systems into the common telephone number file 510 which is a common list file, It has the function to change the common list file concerned into a list file peculiar to the application software for A systems. Similarly the translator B512 changes a list file peculiar to the application software for B systems into the common telephone number file 510 which is a common list file, It has the function to change the common list file concerned into a list file peculiar to the application software for B systems.

[0198]The example of this embodiment of operation is explained. First, mobile radio communication equipment assumes that it is operating as a terminal accommodated in A system. In this state, the executable file for a strange recovery (treatment module) performed by DSP410 supports A system, and this file is stored in the executable file storage 411. At this time, it is recorded on RAM402 by CPU401 that DSP410 is performing the executable file for a strange recovery corresponding to A system (treatment module). At this time, call management system A only for A system is used through the input-and-output device unit 7 by the user. Therefore, the executable file 501 for call management system A stored in the memory storage 5 is read in the resource controller 4, and is performed by CPU401.

[0199]Suppose that the demand a user indicates on a display the menu list "telephone directory A" (namely, telephone number list based on the peculiar telephone number file 503 for call management system A) which is the telephone number list of the partner point to which self telephones frequently to be through the input-and-output device unit 7 was advanced. At this time, the contents of the peculiar telephone number file 503 for call management system A read from the memory storage 5 in the resource controller 4 are read by CPU401 in the

resource controller 4, and it is displayed on the display device in the input-and-output device unit 7.

[0200]If he has telephone number information to newly add to a menu list when the telephone call has been got after a user telephones with reference to the display of the telephone number file on this display device or, he can add. The new telephone number information added is added to the peculiar telephone number file 503 for call management system A first read in the resource controller 4. Next, when a user ends use of call management system A, the rewritten peculiar **** number files 503 for call management system A are stored in the memory storage 5 by CPU401 which is performing the executable file 501 for call management system A.

[0201]According to this embodiment, the telephone number information of the rewritten peculiar telephone number file 503 for call management system A is transformed into the form of the common telephone number file 510 by the translator A511 stored in memory storage, and is managed. Even when the executable file for a strange recovery currently performed by DSP410 by this is changed into the file format corresponding to B system from the file format corresponding to A system and another call management system is used, it makes it possible to use telephone number information.

[0202][when the user specifically ended use of call management system A (the executable file 501 for call management system A application software)],Or when the executable file for a strange recovery currently performed by DSP410 is changed into the file format corresponding to B system from the file format corresponding to A system and RAM402 is rewritten, CPU401 performs the translator A511. Thereby, the peculiar telephone number file 503 for call management system A is transformed into a common file format by the translator A511, and the common telephone number file 510 is overwritten by the file after this conversion.

[0203]Hereafter, drawing 52 explains the flow of this processing. As an initial state, the user who possessed mobile radio communication equipment is located in the service area of A system, and mobile radio communication equipment assumes that it is functioning as a terminal which suited A system. Then, if a user moves and the distance of A system and a base station separates, the receiving field intensity of mobile radio communication equipment will become small, and it will become difficult for mobile radio communication equipment to function as a terminal of A system. At this time, a user is in the service area of B system, and mobile radio communication equipment presupposes that it is in the state where sufficient receiving field intensity is securable to the base station of B system.

[0204]Mobile radio communication equipment has the structure which can perform the change of the radio communications system to be used by supervising whether the reservation of which radio communications system and communications channel is possible using the radio channel for pilots of A system and B system which carries out how [base station] and is connected. Therefore, it can know that mobile radio communication equipment changed into

the state where it becomes impossible to maintain a circuit with A system, and a circuit with B system can be secured instead. At this time, by the resource controller 4, the executable file for a strange recovery performed by DSP410 is changed into the file corresponding to B system stored in the executable file storage 411, and this change is recorded on RAM402 (Step S2001).

[0205]It is confirmed whether, by this point in time, the common telephone number file 510 is overwritten by the translator A511 according to the peculiar telephone number file 503 for call management system A updated at the end (Step S2002). If not overwritten, the translator A512 will be performed by the resource controller 4. Thereby, the peculiar telephone number file 503 for call management system A is transformed into common file form, and the common telephone number file 510 is overwritten by the file after conversion (Step S2003). Then, processing progresses to Step S2004. As a result of the check in Step S2002, if overwritten, processing will progress to Step S2004. Although Step S2004 is not necessarily required processing, at this step S2004, the "telephone directory B" of call management system B is started by the user.

[0206]The translator B512 is started in the following step S2005, The file format of the common telephone number file 510 is transformed into the file format of the peculiar telephone number file 504 for call management system B by this translator B512, and the peculiar telephone number file 504 for call management system B is generated or overwritten by this.

[0207]As mentioned above, the peculiar telephone number files 503 and 504 for object [for call management system A] and call management system B are described by the file format which can be used only with the call management systems A and B corresponding, respectively. When change by the contents of the file 503 or 504 is, the file after change is changed into common file form, and is once saved as the common telephone number file 510. When the radio communications system which mobile radio communication equipment uses is changed, file conversion of the common telephone number file 510 is carried out, and it enables it to use it under the radio communications system after change. That is, in the stage before the radio communications system which mobile radio communication equipment uses is changed, even if the file 503 or 504 is modified, the file in which change was reflected under another radio communications system which mobile radio communication equipment uses next can be used.

[0208]Therefore, the peculiar telephone number file 503 for call management system A as for which the user added change in A system, The "telephone directory B" which could reflect in the peculiar telephone number file 504 for call management system B after shifting to B system, and was reflected becomes available (Step S2006). Namely, when the menu list "telephone directory B" which is the telephone number list in call management system B used only by B system used frequently is displayed, The contents of the menu list "telephone

directory A" updated by call management system A used by A system can be used as it is. The necessity that a user makes individual management of data different radio communications systems by this is lost, and even if it shifts to which radio communications system, the newest self telephone directory can be used.

[0209]Although the peculiar telephone number files 503 and 504 for object [for call management system A] and call management system B presupposed that it exists on the memory storage 5 in above-mentioned explanation, These files 503 and 504 may be temporary files generated on the memory in the resource controller 4 if needed.

[0210](A 12th embodiment) In the mobile radio communication equipment according to a 12th embodiment of this invention shown in drawing 53. They are the object for web browser A and the executable files 601 and 602 for web browser B, an object for web browser A and peculiar URL files 603 and 604 for web browser B, and common URL (Uniform Resource.) to the memory storage 5. The Locators file 610, the translator A611, and the translator B612 are stored. The software for web (Web) browsing with the executable files 601 and 602 peculiar to A system used only by A system and B system, respectively, and B system, That is, it is the application software for displaying the contents of the data file of a WWW page. The function is materialized by the executable files 601 and 602 being read into the resource controller 4, and performing by this controller 4. Peculiar URL files 603 and 604 are favorite (favorite) URL information list files which are used, respectively with the object for web browser A, and the executable files 601 and 602 for B and which were described in inherent file form. On the other hand, common URL file 410 is described in a predetermined common file form.

[0211]The translator A411 and the translator B412, It is the application software for changing a file format mutually between common URL file 410 and a list file peculiar to the browsing software used with the radio communications system which the executable file for a strange recovery specifies. The translator A411 changes into a common list file peculiar URL file 603 for web browser A which is a list file peculiar to the browsing application software for A systems, It has the function to change this common list file into peculiar URL file 603 for web browser A. Similarly the translator B412 changes into a common list file peculiar URL file 604 for web browser B which is a list file peculiar to the browsing application software for B systems, It has the function to change this common list file into peculiar URL file 604 for web browser B. These peculiar URL files 603 and 604 are read into the resource controller 4 by each, and the function is realized by performing by this controller 4.

[0212]As mentioned above, peculiar URL file 603 for web browser A is described by the file format which can be used by the web browser A, and peculiar URL file 604 for web browser B is described by the file format which can be used by the web browser B. Therefore, in the web browser A, if the URL file described by the file format of this exclusive use is not used, specification of a Web page address cannot be performed. Similarly, in the web browser B, if

the URL file described by the file format of this exclusive use is not used, specification of a Web page address cannot be performed.

[0213]According to this embodiment, a URL file is saved in the form of a common list file, and when the radio communications system used by mobile radio communication equipment is changed, the form of this common list file is changed into the radio communications systems of change time by the translator. The URL information of a Web page can be used on a browser using this changed URL file.

[0214]The example of this embodiment of operation is explained. First, mobile radio communication equipment assumes that it is operating as a terminal accommodated in A system. In this state, the executable file for a strange recovery (treatment module) currently performed by DSP410 supports A system, and is stored in the executable file storage 411. When the signal-processing procedure according to this executable file for a strange recovery is performed by DSP410, the function realized by this executable file is realized by mobile radio communication equipment.

[0215]On the other hand, the web browser which a user can use through the input-and-output device unit 7 at this time is the web browser A used only by A system. By control of the resource controller 4 which recognizes that mobile radio communication equipment is applying under A system. The executable file 601 for web browser A stored in the memory storage 5 is read in this controller 4, and browsing by the web browser A of it is made possible because CPU401 performs. Here, the one-shot function preselection capability of the registered Web page address peculiar to this web browser A is prepared for the web browser A by peculiar URL file 603 for web browser A.

[0216]If predetermined operation is performed on the input-and-output device unit 7 when it is thought that a user wants to peruse the Web page often perused on the screen of the web browser A, Peculiar URL file 603 for web browser A is referred to by the web browser A, and the list display of the favorite menu list (URL information list of favorite Web) in the web browser A is carried out. A user chooses and specifies a desired Web page out of the displayed favorite menu list on the input-and-output device unit 7. Then, the signal processing device 3 is controlled by the resource controller 4, and the URL information of this Web page is generated by DSP410. This URL information is passed to the radio-transmission-and-reception device 2, and is transmitted to the base station of A system. The website directed by this URL information on the Internet via an internet provider from this base station is accessed, and the information on a Web page is read. The information on the read Web page follows a reverse course, and is transmitted to mobile radio communication equipment from a base station.

[0217]In mobile radio communication equipment, after the information on the received Web page is sent to the signal processing device 3 via the radio-transmission-and-reception device 2 and is processed by DSP410, the resource controller 4 is passed. In the resource controller

4, the information on the Web page which received is displayed on the screen of the display device in the input-and-output device unit 7 by processing of the web browser A by CPU401.
[0218]Thus, the user can peruse a favorite Web page by easy operation. A user presupposes that a Web page which is newly interested was discovered, perusing a Web page. The user can add URL information of the discovered Web page to a favorite menu list. In that case, if a user performs register operation to a favorite menu list, The resource controller 4 adds a postscript to peculiar [CPU401 which is performing the web browser A] URL file 603 for web browser [which is read in the resource controller 4 in the new URL information concerned to register] A. Then, when a user ends use of the web browser A, CPU401 makes added peculiar URL file 603 for web browser A store in the memory storage 5. Peculiar URL file 603 for web browser A stored in the memory storage 5 is updated by this.
[0219]In this way, since it has a file format of the web browser A for exclusive use, it cannot be referred to by the web browser B, or updated peculiar URL file 603 for web browser A in the memory storage 5 cannot be updated. Then, peculiar URL file 603 for web browser A is changed into a file of common file form, and is stored in the memory storage 5 as the URL common file 610.
[0220]According to this embodiment, the URL information of rewritten peculiar URL file 603 for web browser A is changed into the form of the URL common file 610 by the translator A611 stored in the memory storage 5, and is managed. Even when the executable file for a strange recovery currently performed by DSP410 is changed into the file corresponding to B system from the file corresponding to A system by this and the web browser B comes to be used, it makes it possible to use URL information.
[0221][when the user specifically ended use of the web browser A], Or when the executable file for a strange recovery currently performed by DSP410 is changed into the file format corresponding to B system from the file format corresponding to A system and RAM402 is rewritten, CPU401 performs the translator A611. Thereby, peculiar URL file 603 for web browser A is changed into a common file format by the translator A611, and common URL file 610 is overwritten by the file after this conversion.
[0222]Hereafter, drawing 54 explains the flow of this processing. As an initial state, the user who possessed mobile radio communication equipment is located in the service area of A system, and mobile radio communication equipment assumes that it is functioning as a terminal which suited A system. At this time, by the resource controller 4, the executable file for a strange recovery performed by DSP410 is changed into the file corresponding to B system stored in the executable file storage 411, and this change is recorded on RAM402 (Step S2011). Then, if a user moves and the distance of A system and a base station separates, the receiving field intensity of mobile radio communication equipment will become small, and it will become difficult for mobile radio communication equipment to function as a terminal of A

system. At this time, a user is in the service area of B system, and mobile radio communication equipment presupposes that it is in the state where sufficient receiving field intensity is securable to the base station of B system. It can know that mobile radio communication equipment changed into the state where it becomes impossible to maintain a circuit with A system, and a circuit with B system can be instead secured as mentioned above.

[0223]It is confirmed whether, by this point in time, common URL file 610 is overwritten by the translator A611 according to peculiar URL file 603 for web browser A updated at the end (Step S2012). If not overwritten, the translator A611 will be performed by the resource controller 4. Thereby, peculiar URL file 603 for web browser A is changed into the form of common URL file 610, and common URL file 610 is overwritten by the file after conversion (Step S2013). Then, processing progresses to Step S2014. Although Step S2014 is not necessarily required processing, a "favorite" of web browser B is started by the user at this step S2014.

[0224]In the following step S2015, the translator B612 is started, the file format of common URL file 610 is transformed into the file format of peculiar URL file 604 for web browser B by this translator B612, and this URL file 604 is generated or overwritten.

[0225]As mentioned above, the object for web browser A and peculiar URL files 603 and 604 for web browser B are described by the file format which can be used by the web browser A corresponding, respectively and the web browser B. Therefore, if the peculiar URL file described by the file format of this exclusive use in the web browser A is not used, It cannot use for Web page specification, and similarly, by the web browser B, if the peculiar URL file described by the file format of this exclusive use is not used, even if it is found with much trouble and has registered with the file, a favorite Web page cannot be specified. By changing into the file format corresponding to the web browser which changes and saves a peculiar URL file at the URL common file 610 which is a common file format, and has the URL common file 610 used further, if this embodiment is followed. It becomes possible to use in the web browser. Thus, the list of Web pages based on the peculiar URL file for browsers can be used now. The user who shifted to B system from A system needs peculiar URL file 604 for web browser B for displaying the favorite menu list in the web browser B used only by B system. Since peculiar URL file 604 for web browser B in which contents of change were reflected by conversion of the file format can be obtained according to this embodiment, When a favorite menu list is displayed, it becomes possible to reflect the contents of the favorite menu list updated by the web browser A used by A system as it is (Step S2016). The necessity that a user does individual management of such data is lost to a different radio communications system, and convenience improves greatly.

[0226]Although an object for web browser A and peculiar URL files 603 and 604 for web browser B presupposed that it exists on the memory storage 5 in above-mentioned explanation, These files 603 and 604 may be temporary files generated on a memory in the

resource controller 4 ** and if needed.

[0227](A 13th embodiment) In mobile radio communication equipment according to a 13th embodiment of this invention shown in drawing 55. An object for e-mail system A and the executable files 701 and 702 for e-mail system B, an object for e-mail system A and the peculiar receiving mailfiles 703 and 704 for e-mail system B, the reception mail common file 710, and the translators A711 and B712 are stored in the memory storage 5.

[0228]The executable files 701 and 702 are e-mail systems peculiar to A system and B system which are used only by A system and B system, respectively, i.e., software for mailing used for E-mail transmission and reception. The executable files 701 and 702 are read into the resource controller 4, and a mailing function is realized by performing by this controller 4.

[0229]The mailfiles 703 and 704 are receiving mailfiles described in the inherent file form used with the executable files 701 and 702, respectively. On the other hand, the reception mail common file 710 is described in a predetermined common file form.

[0230]The translators A711 and B712 The reception mail common file 710, It is the file conversion application software for changing a file format mutually between peculiar receiving mailfiles with a peculiar file format in the e-mail system used with the radio communications system which the executable file for a strange recovery specifies. The translator A711 has the function to change the peculiar receiving mailfile 703 for e-mail system A which is a receiving mailfile peculiar to the mailing application software for A systems into the file format of the reception mail common file 710 which is a file format for common. Similarly, the translator B712 has the function to change the reception mail common file 710 into the peculiar receiving mailfile 703 for e-mail system A. These files 703 and 704 are read into the resource controller 4 by each, and the function is realized by performing by this controller 4.

[0231]As mentioned above, the peculiar receiving mailfile 703 for e-mail system A is described by the file format only for application software which can be used by the e-mail system A, The peculiar receiving mailfile 704 for e-mail system B is described by the file format only for application software which can be used by the e-mail system B.

[0232]Operation of this embodiment is explained. First, mobile radio communication equipment assumes that it is operating as a terminal accommodated in A system. In this state, the executable file for a strange recovery (treatment module) currently performed by DSP410 supports A system, and is stored in the executable file storage 411. When the signal-processing procedure according to this executable file for a strange recovery is performed by DSP410, the function realized by this executable file is realized by mobile radio communication equipment.

[0233]On the other hand, the e-mail system which the user uses through the input-and-output device unit 7 at this time is the e-mail system A only for A system. When the executable file 701 for e-mail system A stored in the memory storage 5 is read into the memory in the

resource controller 4 which is not illustrated and is performed by CPU401 in the resource controller 4, the e-mail system A concerned is available.

[0234]A user advances the demand which shows on a display the menu list "reception mail" which is a list of the reception mail which it is sent to self-addressed until now, and has been saved at the memory storage 5 through the input-and-output device unit 7. CPU401 which received this demand displays on the display device in the input-and-output device unit 7 the contents of the peculiar receiving mailfile 703 for e-mail system A read from the memory storage 5 in the resource controller 4. Therefore, the inspection of reception mail is possible for a user, and if it sends a reply to this and there is mail which newly received a message, adding to this list is possible. In that case, the contents of new reception mail are added to the peculiar receiving mailfile 703 for e-mail system A first read into the memory in the resource controller 4 which is not illustrated by CPU401. When a user ends use of the e-mail system A next, CPU401 makes the added peculiar receiving mailfile 703 for e-mail system A store in the memory storage 5.

[0235]According to this embodiment, when mobile radio communication equipment shifts to another radio communications system, a file format is changed so that the receiving mailfile used until now can be used. Namely, when mobile radio communication equipment uses A system, it is received by the e-mail system A only for A system, When mobile radio communication equipment shifts to B system, it enables it to use the contents of the reception mail saved at the peculiar receiving mailfile 703 for e-mail system A also in the e-mail system B only for B system. For this reason, when the peculiar receiving mailfile 703 for e-mail system A is updated, Or after mobile radio communication equipment shifts to B system, the peculiar receiving mailfile 703 is changed into the form of the common receiving mailfile 420 by the translator A421 stored in the memory storage 5, and is managed by the common receiving mailfile 420.

[0236][when the user specifically ended use of the e-mail system A], Or when the executable file for a strange recovery currently performed by DSP410 is changed into the file corresponding to B system from the file corresponding to A system and RAM402 is rewritten, CPU401 performs the translator A712. Thereby, the peculiar receiving mailfile 703 for e-mail system A is changed into a common file format by the translator A710, and the common receiving mailfile 420 is overwritten by the file after this conversion.

[0237]Hereafter, drawing 56 explains the flow of this processing. As an initial state, the user who possessed mobile radio communication equipment is located in the service area of A system, and mobile radio communication equipment assumes that it is functioning as a terminal which suited A system. At this time, by the resource controller 4, the executable file for a strange recovery performed by DSP410 is changed into the file corresponding to B system stored in the executable file storage 411, and this change is recorded on RAM402 (Step

S2021). Then, if a user moves and the distance of A system and a base station separates, the receiving field intensity of mobile radio communication equipment will become small, and it will become difficult for mobile radio communication equipment to function as a terminal of A system. At this time, a user is in the service area of B system, and mobile radio communication equipment presupposes that it is in the state where sufficient receiving field intensity is securable to the base station of B system. It can know that mobile radio communication equipment changed into the state where it becomes impossible to maintain a circuit with A system, and a circuit with B system can be instead secured as mentioned above.

[0238]According to the peculiar receiving mailfile 703 for e-mail system A updated at the end by this point in time, it is confirmed whether the common receiving mailfile 710 is overwritten by the translator A712 (Step S2022) -- as mentioned above, At this time, a file format is changed from the inside of the peculiar receiving mailfile 703 for e-mail system A by the translator A712, and the common receiving mailfile 420 is overwritten according to the file after conversion (Step S2023). Then, processing progresses to Step S2024. Although Step S2024 is not necessarily required processing, at this step S2024, the "receiving box" of the e-mail system B is started by the user.

[0239]The translator B712 is started in the following step S2025, The file format of the common receiving mailfile 420 is transformed into the form of the peculiar receiving mailfile 704 for e-mail system B by the ** translator B712, and this receiving mailfile 704 is generated or overwritten (Step S2025).

[0240]As mentioned above, the peculiar receiving mailfile 704 for e-mail system B is described by the file format which can be used by the e-mail system B. Therefore, the above-mentioned file conversion enables it to reflect the contents of the menu list "reception mail" updated by the e-mail system A as it is, when a user displays the menu list "receiving box" which is the reception mail list of the e-mail systems B (Step S2026). Different necessity that a user does individual management of such data for every radio communications system is lost, and convenience improves greatly.

[0241]Although an object for e-mail system A and the peculiar receiving mailfiles 703 and 704 for B shall exist on the memory storage 5 in the above-mentioned explanation, These files 703 and 704 may be temporary files generated on a memory in the resource controller 4 which is not illustrated if needed. The completely same management as the above is possible also about information on mail which put reception mail on transmitting mail, changed it by explanation mentioned above, and a user transmitted in the past. The completely same management as the above is possible also about a partner's mail address information that a user transmits and receives e-mail frequently.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The mimetic diagram showing the function of the block diagram and signal processing device in which the composition of the mobile radio communication equipment according to a 1st embodiment of this invention is shown
[Drawing 2]The block diagram showing the example of composition of the radio-transmission-and-reception device in drawing 1 (a)
[Drawing 3]The block diagram showing the example of composition of the signal processing device in drawing 1 (a), and a resource controller, and the example of composition of SPU in a signal processing device
[Drawing 4]The block diagram showing the example of composition of CPU in drawing 3 (a)
[Drawing 5]The block diagram showing other examples of composition of SPU in drawing 3 (a)
[Drawing 6]The block diagram showing the composition of the address conversion circuit for SPU in drawing 3 (a)
[Drawing 7]The block diagram showing the example of composition of the signal processing device according to a 2nd embodiment of this invention
[Drawing 8]The block diagram showing the example of composition of the signal processing device according to a 3rd embodiment of this invention
[Drawing 9]The block diagram showing the example of composition of the signal processing device according to a 4th embodiment of this invention
[Drawing 10]The block diagram showing still more concretely the composition of the signal processing device shown in drawing 9
[Drawing 11]The block diagram showing the composition of the signal processing device in the mobile radio communication equipment according to a 5th embodiment of this invention
[Drawing 12]The figure showing the connection state corresponding to one radio communications system with the signal processing device shown in drawing 11

[Drawing 13]The figure showing the connection state corresponding to one radio communications system of everything but the signal processing device shown in drawing 11
[Drawing 14]The figure showing the connection state corresponding to two radio communications systems of the signal processing device shown in drawing 11
[Drawing 15]The block diagram showing the example of composition of the resource controller in the mobile radio communication equipment according to a 5th embodiment
[Drawing 16]The figure showing the example of composition of the radio communications system which contains the mobile radio communication equipment according to a 5th embodiment as a terminal
[Drawing 17]The figure showing other examples of composition of the radio communications system which contains the mobile radio communication equipment according to a 5th embodiment as a terminal
[Drawing 18]The flow chart which shows the example of the radio communications system shown in drawing 17 of operation
[Drawing 19]The flow chart which shows other examples of the radio communications system shown in drawing 17 of operation
[Drawing 20]The flow chart which shows another example of the radio communications system shown in drawing 17 of operation
[Drawing 21]The block diagram showing the layer composition in the conventional base station

[Drawing 22]The block diagram showing the layer composition in the base station according to a 5th embodiment
[Drawing 23]The figure showing the example of composition of the table used in order to grasp the base station ****** resource shown in drawing 22
[Drawing 24]The figure showing the example of the resource list which TRC in drawing 22 uses
[Drawing 25]The figure showing the layer composition of a base station and a terminal according to a 5th embodiment
[Drawing 26]The figure showing the example of the message which transmits to RRC in drawing 22 for grasp of TRC of a terminal resource
[Drawing 27]The figure showing an example of the resource using history table transmitted to base station BS from terminal MT in drawing 25
[Drawing 28]The figure showing an example of the message which RRC which received this resource using history table in base station BS in drawing 25 transmits to TRC
[Drawing 29]The block diagram showing the composition of the mobile radio communication equipment according to a 6th embodiment of this invention
[Drawing 30]The figure showing the signal processing device storage area in drawing 29, and

the example of contents of memory storage
[Drawing 31]The figure showing the storage area of the signal processing device in drawing 29, and other examples of contents of memory storage
[Drawing 32]The flow chart which makes the rewriting procedure of the module in the resource of the signal processing device in drawing 29 correspond to drawing 31, and shows it
[Drawing 33]The figure showing the storage area of the signal processing device in drawing 29, and another example of contents of memory storage
[Drawing 34]The flow chart which makes the rewriting procedure of the module in the resource of the signal processing device in drawing 29 correspond to drawing 33, and shows it
[Drawing 35]The block diagram showing the composition of the mobile radio communication equipment according to a 7th embodiment of this invention
[Drawing 36]The flow chart which shows the example of operation in a 7th embodiment
[Drawing 37]The flow chart which shows other examples of operation in a 7th embodiment
[Drawing 38]The block diagram showing the composition of the mobile radio communication equipment according to an 8th embodiment of this invention
[Drawing 39]The block diagram showing the composition of the mobile radio communication equipment according to a 9th embodiment of this invention
[Drawing 40]The figure showing the composition of mobile radio communication equipment and the example of composition of a module management table according to a 10th embodiment of this invention
[Drawing 41]The figure showing the example of contents before an example of the item list described by the module management table in drawing 40 (b), and renewal of each item of a module using history table, and after updating, respectively
[Drawing 42]The flow chart which shows the procedure for deleting the unnecessary module in the memory storage in drawing 40 (a) using the module using history table shown in drawing 41 (a)
[Drawing 43]The figure showing the example of contents before renewal of each item shown in other examples of an item list and drawing 43 (a) of a module using history table which were described by the module using history table in drawing 40 (a), and after updating, respectively
[Drawing 44]The flow chart which shows the procedure for deleting the unnecessary module in the memory storage in drawing 40 (a) using the module using history table shown in drawing 43 (a)
[Drawing 45]The figure showing the example of contents before renewal of each item shown in other examples of an item list and drawing 43 (a) of a module using history table which were described by the module using history table in drawing 40 (b), and after updating, respectively
[Drawing 46]The flow chart which shows the procedure for deleting the unnecessary module in the memory storage in drawing 40 (a) using the module using history table shown in drawing

45 (b)

[Drawing 47]The figure showing another example of an item list and the example of contents of each item of a module using history table which were described by the module using history table in drawing 40 (b)

[Drawing 48]The flow chart which shows the procedure which carries out rewriting processing of the module in the memory storage in drawing 40 (a) using the module using history table shown in drawing 43 (b)

[Drawing 49]The flow chart which shows procedure for the user of the mobile radio communication equipment concerning a 10th embodiment to specify an unnecessary module, and delete this module

[Drawing 50]The figure showing another example of an item list, the example of contents of each item of a module using history table, and the example of display information of a module using history table which were described by the module using history table in drawing 40 (b)

[Drawing 51]The block diagram showing the composition of the mobile radio communication equipment according to an 11th embodiment of this invention

[Drawing 52]The flow chart which shows the procedure in an 11th embodiment

[Drawing 53]The block diagram showing the composition of the mobile radio communication equipment according to a 12th embodiment of this invention

[Drawing 54]The flow chart which shows the procedure in a 12th embodiment

[Drawing 55]The block diagram showing the composition of the mobile radio communication equipment according to a 13th embodiment of this invention

[Drawing 56]The flow chart which shows the procedure in a 13th embodiment.

[Explanations of letters or numerals]

1 -- Antenna

2 -- Radio-transmission-and-reception device

3 -- Signal processing device

4 -- Resource controller

6 -- System controller

7 -- Input-and-output device unit

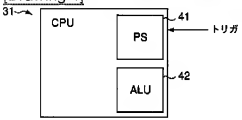
[Translation done.]

* NOTICES *

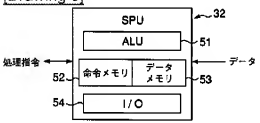
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

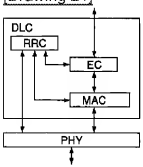
[Drawing 4]



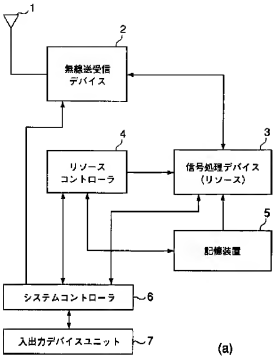
[Drawing 5]



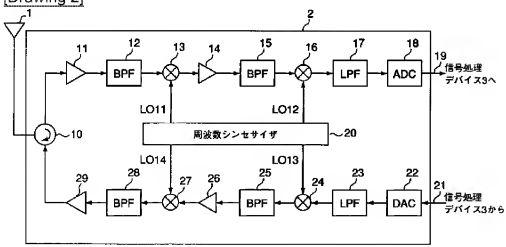
[Drawing 21]



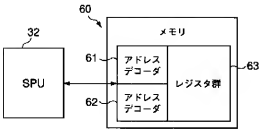
[Drawing 1]



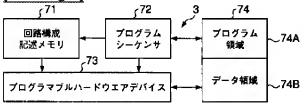
[Drawing 2]



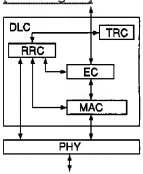
[Drawing 6]



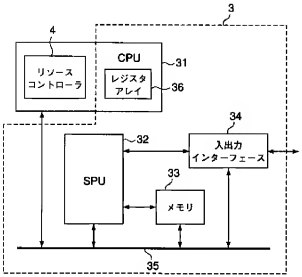
[Drawing 7]



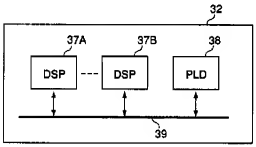
[Drawing 22]



[Drawing 3]

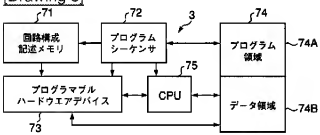


(a)

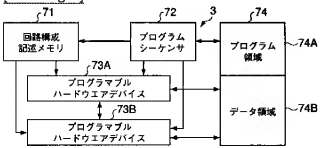


(b)

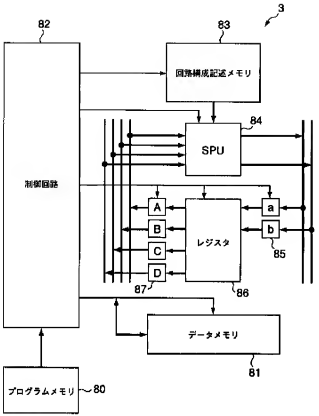
[Drawing 8]



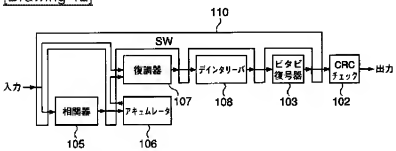
[Drawing 9]



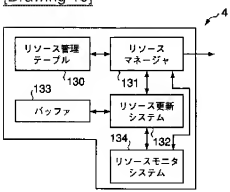
[Drawing 10]



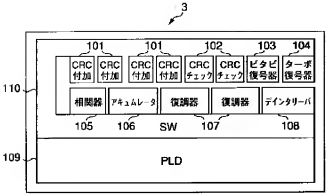
[Drawing 12]



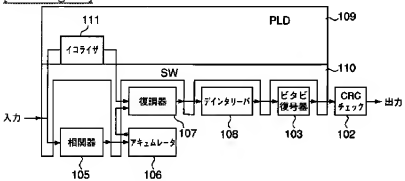
[Drawing 15]



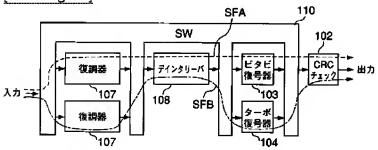
[Drawing 11]



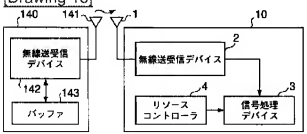
[Drawing 13]



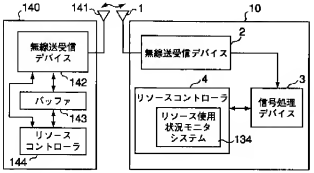
[Drawing 14]



[Drawing 16]



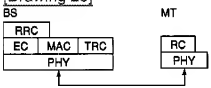
[Drawing 17]



[Drawing 23]

機体番号	機種 ID	バージョン ID	リソース	製造メーカ
A 327 - 010001 ～ A 327 - 034800	KA 32	7	List 32 - 7	A 社
A 327 - 034801 ～ A 327 - 040000	KA 32	8	List 32 - 8	A 社
B 01 - 01 ～ B 01 - 020000	KB 01	1	List 01 - 1	B 社
B 01 - 20001 ～ B 01 - 040000	KB 01	2	List 01 - 2	B 社

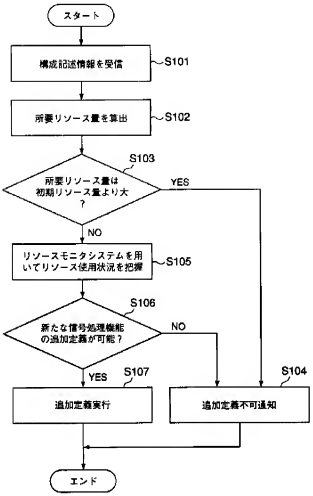
[Drawing 25]



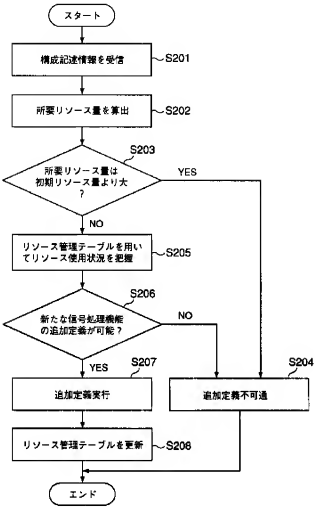
[Drawing 27]

オフセット	内容
0X00	未使用のCRC接続ブロックの数
0X01	未使用のCRCチェックブロックの数
0X02	未使用の相関器の数
0X03	未使用のアキュムレータの数
0X0a	未使用のPLDの数

[Drawing 18]


スタート
構成記述情報を受信
S101
所要リソース量を算出
S102
S103
所要リソース量は初期リソース量より大？
YES
NO
リソースモニタシステムを用いてリソース使用状況を把握
S105
S106
新たな信号処理機能の追加定義が可能？
NO
YES
S107
S104
追加定義実行
追加定義不可通知
エンド

[Drawing 19]



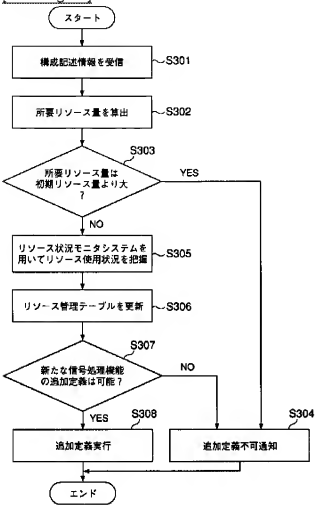
[Drawing 24]

再定義不可能領域	機能ブロック名	リソースエリアA	リソースエリアB	特記事項
	累積加算	10	2	
	相関器	4	12	
	ビタビ復号器	2	2	エリア毎にレートが設定される
	CRCチェック	2	4	
再定義可能ブロック	PLDブロック数	6200	6200	エリアAとエリアBを共用する場合には使用可能なブロックの数は5400+5400

[Drawing 26]

メッセージ名称	MT空きリソースリスト要求
ソース	TRC (BS)
あて先	RRC (BS)
引数の種類	再定義不可能な領域の情報を要求する
	再定義可能な領域の情報を要求する
	再定義が可能な領域および不可能な領域の情報を要求する

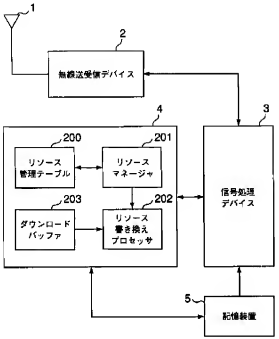
[Drawing 20]



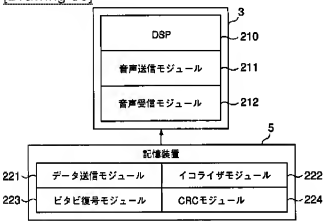
[Drawing 28]

メッセージ名称	MT空きリソースリスト
ソース	TRC (BS)
あて先	RRC (BS)
引数の種類	"再定義不可能な領域の情報を要求する" に対する応答
	"再定義可能な領域の情報を要求する" に対する応答
	"再定義可能な領域および不可能な領域の情報を要求する" に対する応答

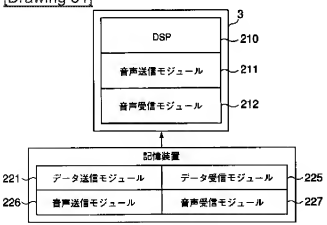
[Drawing 29]



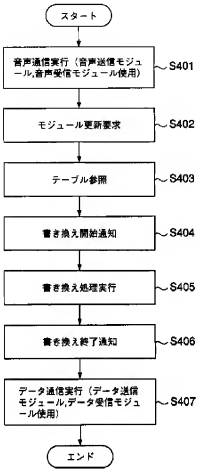
[Drawing 30]



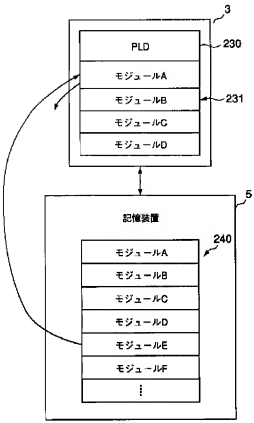
[Drawing 31]



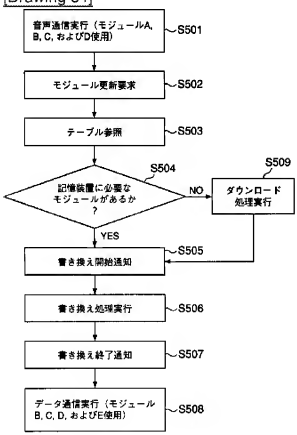
[Drawing 32]


スタート
音声通信実行（音声送信モジュール,音声受信モジュール使用）
S401
モジュール更新要求
S402
テーブル参照
S403
書き換え開始通知
S404
書き換え処理実行
S405
書き換え終了通知
S406
データ通信実行（データ送信モジュール,データ受信モジュール使用）
S407
エンド

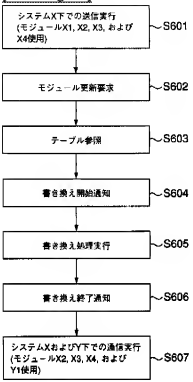
[Drawing 33]


3
PLD
230
モジュールA
モジュールB
231
モジュールC
モジュールD
5
記憶装置
240
モジュールA
モジュールB
モジュールC
モジュールD
モジュールE
モジュールF

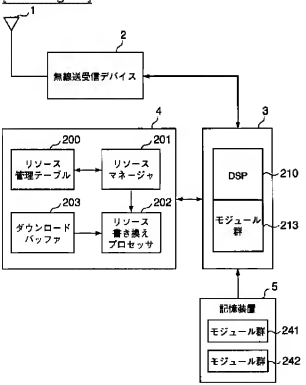
[Drawing 34]


音声通信実行（モジュールA, B, C, およびD使用）
S501
モジュール更新要求
S502
テーブル参照
S503
S504
記憶装置に必要なモジュールがあるか？
NO
S509
ダウンロード処理実行
YES
S505
書き換え開始通知
書き換え処理実行
S506
書き換え終了通知
S507
データ通信実行（モジュールB, C, D, およびE使用）
S508

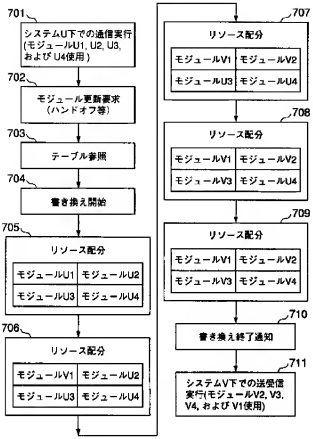
[Drawing 36]



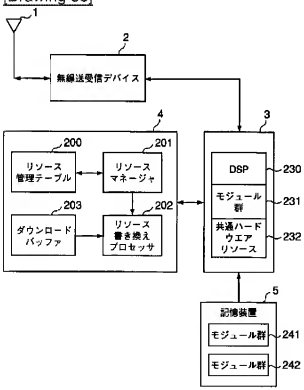
[Drawing 35]



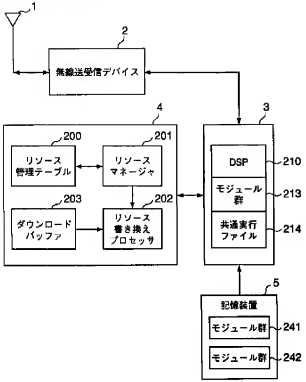
[Drawing 37]


701
システムU下での通信実行(モジュールU1, U2, U3, およびU4使用)
702
モジュール更新要求(ハンドオフ等)
703
テーブル参照
704
書き換え開始
705
リソース配分
モジュールU1 モジュールU2
モジュールU3 モジュールU4
706
リソース配分
モジュールV1 モジュールU2
モジュールU3 モジュールU4
707
リソース配分
モジュールV1 モジュールV2
モジュールU3 モジュールU4
708
リソース配分
モジュールV1 モジュールV2
モジュールV3 モジュールU4
709
リソース配分
モジュールV1 モジュールV2
モジュールV3 モジュールV4
710
書き換え終了通知
711
システムV下での送受信実行(モジュールV2, V3, V4, およびV1使用)

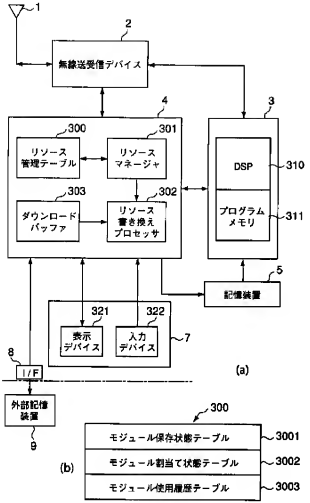
[Drawing 38]


1
2
無線送受信デバイス
4
3
200
201
リソース管理テーブル
リソースマネージャ
203
202
ダウンロードバッファ
リソース書き換えプロセッサ
DSP
230
モジュール群
231
共通ハードウエアリソース
232
5
記憶装置
モジュール群
241
モジュール群
242

[Drawing 39]



[Drawing 40]


1
2
無線送受信デバイス
4
3
300
301
リソース管理テーブル
リソースマネージャ
DSP
310
303
302
ダウンロードバッファ
リソース書き換えプロセッサ
プログラムメモリ
311
5
記憶装置
321
322
表示デバイス
入力デバイス
7
8
I/F
(a)
外部記憶装置
9
300
モジュール保存状態テーブル
3001
(b)
モジュール割当て状態テーブル
3002
モジュール使用履歴テーブル
3003

[Drawing 41]

モジュール使用履歴テーブルの項目

モジュール名
モジュールサイズ
使用頻度
保存状態
割当て状態

(a)

モジュール使用履歴テーブルの内容例

モジュール名	モジュールサイズ	使用頻度	保存状態	割当て状態
QPSK 変調	10200Byte	320	0X1000	ON
相関器	15300Byte	230	0X4000	ON
畳み込み符号化	12900Byte	202	0X5000	OFF
PN 符号化	25000Byte	23	0X3000	OFF
ウォルシュ符号化	18000Byte	9	NO	OFF

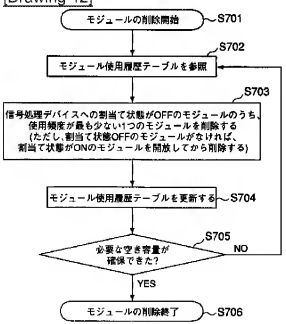
(b)

更新されたモジュール使用履歴テーブル

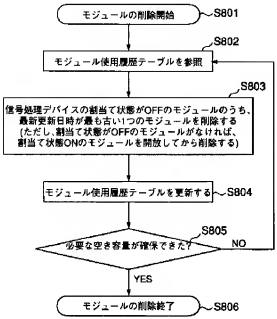
モジュール名	モジュールサイズ	使用頻度	保存状態	割当て状態
QPSK変調	10200Byte	320	0X1000	ON
相関器	15300Byte	230	0X4000	ON
畳み込み符号化	12900Byte	202	0X5000	OFF
PN符号化	25000Byte	23	0X3000	OFF

(c)

[Drawing 42]



[Drawing 44]



[Drawing 43]

モジュール使用履歴テーブルの項目

モジュール名
モジュールサイズ
最新使用日時
保存状態
割当て状態

(a)

モジュール使用履歴テーブルの内容例

モジュール名	モジュールサイズ	最新更新日	保存状	割当て状
QPSK変調	10200Byte	2005 / 04 / 14	0X1000	ON
相関器	15300Byte	2005 / 12 / 21	0X4000	ON
重み込み符号化	12900Byte	2003 / 05 / 04	0X5000	OFF
PN符号化	25000Byte	2005 / 02 / 03	0X3000	OFF
ウォルシュ符号化	18000Byte	2005 / 08 / 14	NO	OFF

(b)

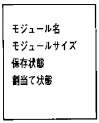
更新されたモジュール使用履歴テーブル

モジュール名	モジュールサイズ	最新更新日	保存状	割当て状
QPSK変調	10200Byte	2005 / 04 / 14	0X1000	ON
相関器	15300Byte	2005 / 12 / 21	0X4000	ON
PN符号化	25000Byte	2005 / 02 / 03	0X3000	OFF
ウォルシュ符号化				OFF

(c)

[Drawing 45]

モジュール使用履歴テーブルの項目



(a)

モジュール使用履歴テーブルの内容例

モジュール名	モジュールサイズ	保存状	割当て状
QPSK変調	10200Byte	0X1000	ON
相関器	15300Byte	0X4000	ON
畳み込み符号化	12900Byte	0X5000	OFF
PN符号化	25000Byte	0X3000	OFF
ウォルシュ符号化	18000Byte	NO	OFF

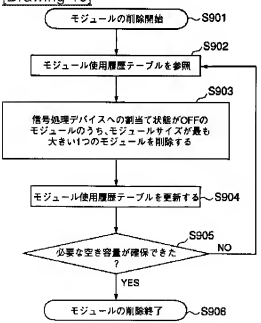
(b)

更新されたモジュール使用履歴テーブル

モジュール名	モジュールサイズ	保存状	割当て状
QPSK変調	10200Byte	0X1000	ON
相関器	15300Byte	0X4000	ON
PN符号化	12900Byte	0X5000	OFF
ウォルシュ符号化	18000Byte	NO	OFF

(c)

[Drawing 46]



[Drawing 47]

モジュール使用履歴テーブルの項目

モジュール名
モジュールサイズ
バージョン
保存状態
割当て状態

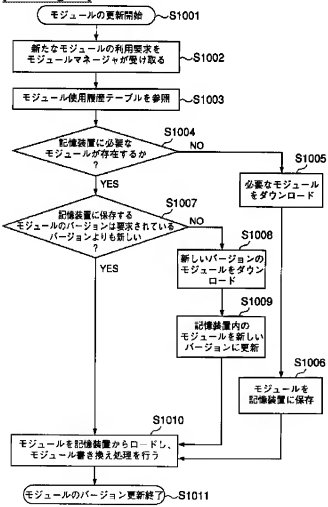
(a)

モジュール使用履歴テーブルの内容例

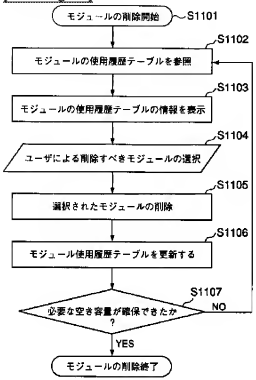
モジュール名	モジュールサイズ	バージョン	保存状	割当て状
QPSK変調	10200Byte	2.1	0X1000	ON
相関器	15300Byte	1.3	0X4000	ON
畳み込み符号化	12900Byte	3.1	0X5000	OFF
PN符号化	25000Byte	2.3	0X3000	OFF
ウォルシュ符号化	18000Byte	1.8	0X6000	OFF

(b)

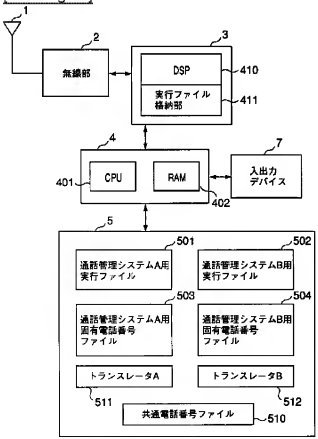
[Drawing 48]



[Drawing 49]

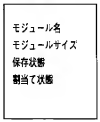


[Drawing 51]



[Drawing 50]

モジュール使用履歴テーブルの項目



(a)

モジュール使用履歴テーブルの内容例

モジュール名	モジュールサイズ	保存状	割当て状
QPSK変調	10200Byte	0X1000	ON
増幅器	15300Byte	0X4000	ON
畳み込み符号化	12900Byte	0X5000	OFF
PN符号化	25000Byte	0X3000	OFF

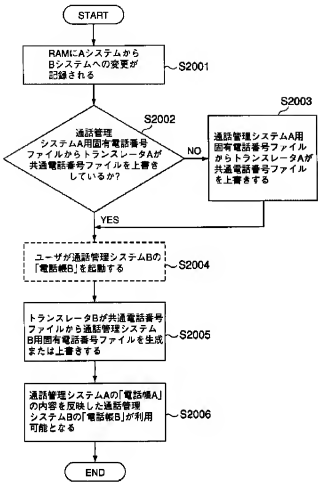
(b)

履歴情報の表示例

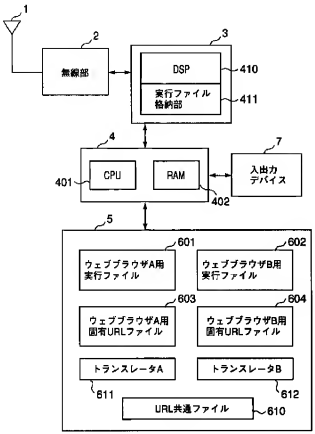
現在保存されているモジュール			
No.	モジュール名	モジュールサイズ	状態
1	インターネット接続	586400Byte	使用中
2	メールシステム	74500Byte	使用中
3	動画像再生	32900Byte	使用中
4	呼び出し音声拡張	15000Byte	-
5	GSPシステム	36000Byte	-
何番のモジュールを削除しますか。(数字で入力してください) →_			

(c)

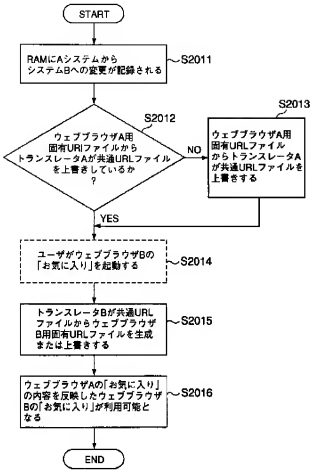
[Drawing 52]


START
RAMにAシステムから
Bシステムへの変更が
記録される
S2001
S2002
通話管理
システムA用固有電話番号
ファイルからトランスレータAが
共通電話番号ファイルを上書き
しているか?
NO
S2003
通話管理システムA用
固有電話番号ファイル
からトランスレータAが
共通電話番号ファイル
を上書きする
YES
ユーザが通話管理システムBの
「電話帳B」を起動する
S2004
トランスレータBが共通電話番号
ファイルから通話管理システム
B用固有電話番号ファイルを生成
または上書きする
S2005
通話管理システムAの「電話帳A」
の内容を反映した通話管理
システムBの「電話帳B」が利用
可能となる
S2006
END

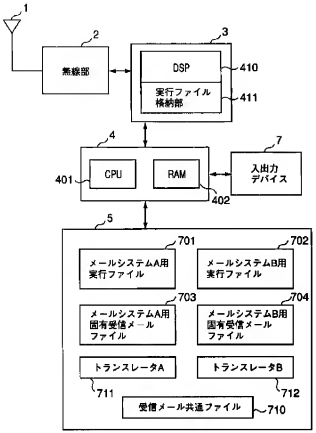
[Drawing 53]


1
2
無線部
3
DSP
410
実行ファイル
格納部
411
4
CPU
401
RAM
402
7
入出力
デバイス
5
601
ウェブブラウザA用
実行ファイル
602
ウェブブラウザB用
実行ファイル
603
ウェブブラウザA用
固有URLファイル
604
ウェブブラウザB用
固有URLファイル
トランスレータA
611
トランスレータB
612
URL共通ファイル
610

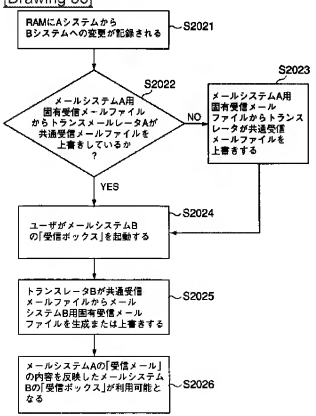
[Drawing 54]


START
RAMにAシステムから
システムBへの変更が記録される
S2011
S2012
ウェブブラウザA用
固有URIファイルから
トランスレータAが共通URLファイル
を上書きしているか
?
NO
S2013
ウェブブラウザA用
固有URLファイル
からトランスレータA
が共通URLファイルを
上書きする
YES
ユーザがウェブブラウザBの
「お気に入り」を起動する
S2014
トランスレータBが共通URL
ファイルからウェブブラウザ
B用固有URLファイルを生成
または上書きする
S2015
ウェブブラウザAの「お気に入り」
の内容を反映したウェブブラウザ
Bの「お気に入り」が利用可能と
なる
S2016
END

[Drawing 55]


1
2
無線部
3
DSP
410
実行ファイル
格納部
411
4
CPU
401
RAM
402
7
入出力
デバイス
5
701
メールシステムA用
実行ファイル
702
メールシステムB用
実行ファイル
703
メールシステムA用
固有受信メール
ファイル
704
メールシステムB用
固有受信メール
ファイル
トランスレータA
711
トランスレータB
712
受信メール共通ファイル
710

[Drawing 56]


RAMにAシステムから
Bシステムへの変更が記録される
S2021
S2022
メールシステムA用
固有受信メールファイル
からトランスメールレータAが
共通受信メールファイルを
上書きしているか
?
NO
S2023
メールシステムA用
固有受信メール
ファイルからトランス
レータが共通受信
メールファイルを
上書きする
YES
ユーザがメールシステムB
の「受信ボックス」を起動する
S2024
トランスレータBが共通受信
メールファイルからメール
システムB用固有受信メール
ファイルを生成または上書きする
S2025
メールシステムAの「受信メール」
の内容を反映したメールシステム
Bの「受信ボックス」が利用可能と
なる
S2026

[Translation done.]